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The Journal *of the* SOCIETY OF DYERS AND COLOURISTS

Volume 68 Number 1

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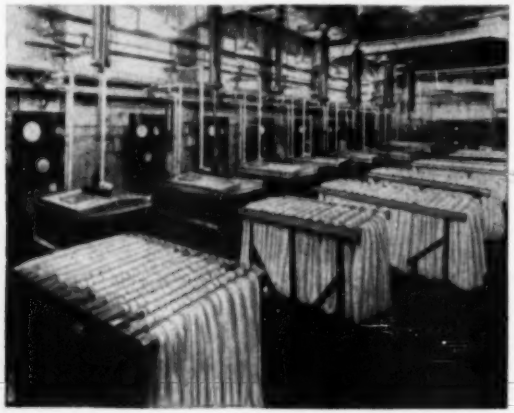

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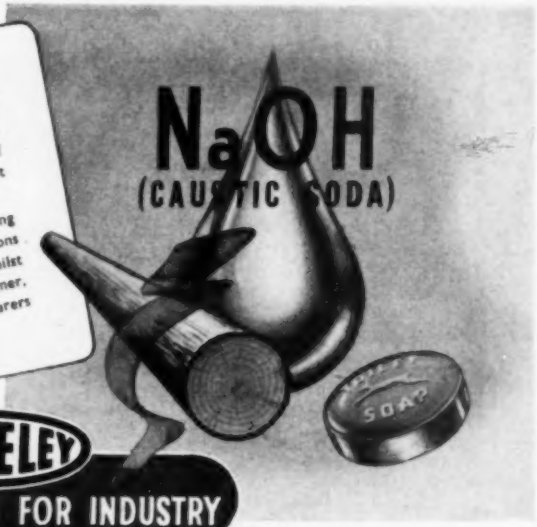

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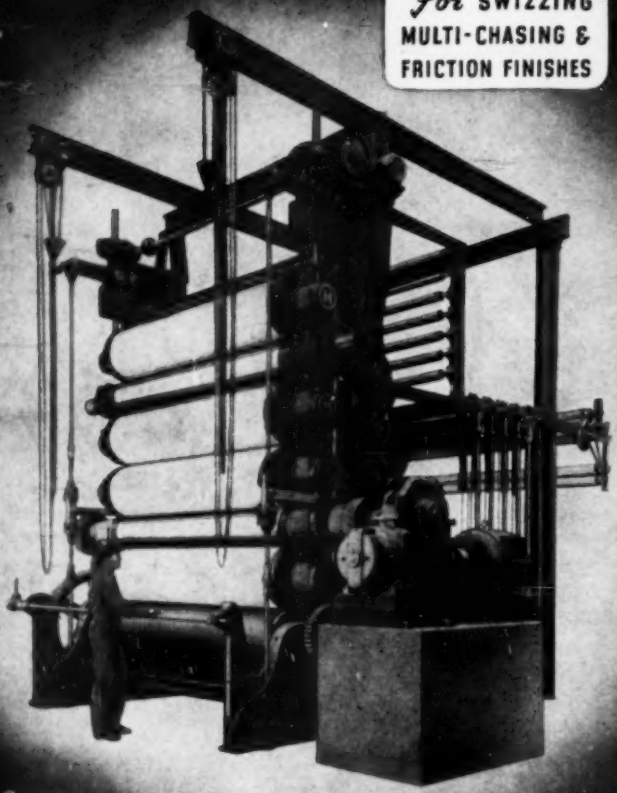

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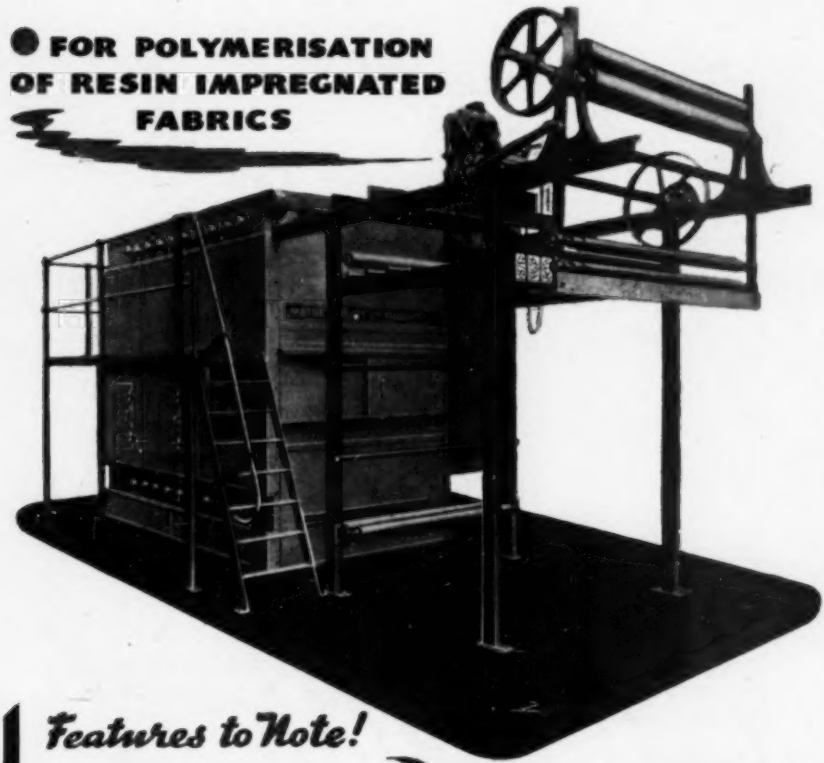

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NOTICE TO MEMBERS AND SUBSCRIBERS

Readers requiring *general information* regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1–6 of the January 1952 and pages 253–256 of the July 1951 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, 32–34 Piccadilly, Bradford, Yorkshire (*Telephone* Bradford 25138–9). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

LECTURES

The pH Control of Acid and Chrome Dyeing—
II—Single-bath Mordant Dyeing — *G. H. Lister*

COMMUNICATIONS

Package Dyeing—
I—A Theoretical Model and its relation to Technical Practice — *J. Boulton and J. Crank*

The Action of β-Propiolactone on Wool
C. Fearnley and J. B. Speakman

The Heats and Free Energies of Formation of some Hydrogen Bonds
M. St. C. Flett

Studies in the Fundamental Processes of Textile Printing.
III— The Transfer of Acid Dyes to Cellulose during Steaming — *R. B. Patel and H. A. Turner*

Some Further Investigations into the Fading Rates of Monoazo Dyes
R. H. Peters and E. Atherton

The Rôle of Foam in Detergent Action — *D. G. Stevenson*

MEMBERS' CHANGES OF ADDRESS

Bielawski, F. W., formerly of Lincs., to c/o Turnbulls Ltd., Hawick, Roxburghshire, Scotland.

Bouckaert, K. J., formerly of Belgium, to c/o International Hotel, Zuider Paarl, Cape Province, South Africa.

Brassard, H. A., formerly of Suffolk, to c/o Laporte Chemicals Ltd., Hanover House, 14 Hanover Square, London W.1.

Bromley, J., formerly of Essex, to 11 Triscombe Avenue, Bridgwater, Somerset.

Dalton, A. B., formerly of Manchester, to c/o P.O. Box 2629, G.P.O., Johannesburg, South Africa.

Kotob, Zuheir, formerly of c/o Mr. Adib Kotob, to c/o Anwer Kotob, Damascus, Syria.

Kumar, B. K., formerly of Shipley, to 136 Manley Road, Manchester 16.

Mitchell, J. A., formerly of Widnes, to 29 Victoria Road, Runcorn, Cheshire.

Piesse, A. D. J., formerly of Manchester, to "Limani", Percy Street, Devonport, Tasmania, Australia.

Russell, W., formerly of Bradford, to c/o Hardman & Holden, Research Lab., James Street, Miles Platting, Manchester 10.

Thornton, E., formerly of Huddersfield, to 35 Moor Allerton Crescent, Moortown, Leeds 7.

ADDRESSES WANTED

Breitfield, E., formerly of 16 Heathway Court, Childs Hill, Finchley Road, London NW3.

Gunson, H., formerly of 217 Cross Lane, Newsome, Huddersfield.

Justice, A., formerly of 35 Cumberland Avenue, Liverpool.

Kulkarni, V. S., formerly of Kirparum Mehtas Street, Gopipura, Surat, India.

Leman, R., formerly of 12 Ballerat Street, Levenshulme, Manchester 19.

Mroguik, J. S., formerly of 121 Glenfield Road, Leicester.

Presbury, J., formerly of 7 Sparthfield Avenue, Rochdale.

de Franca Pereira F. A., formerly of Rua Presidente Wilson, No. 64-1°-Dt, Lisboa, Portugal.

Selby, W., formerly of "Westwood", Woodhead Road, Stanningley, near Leeds.

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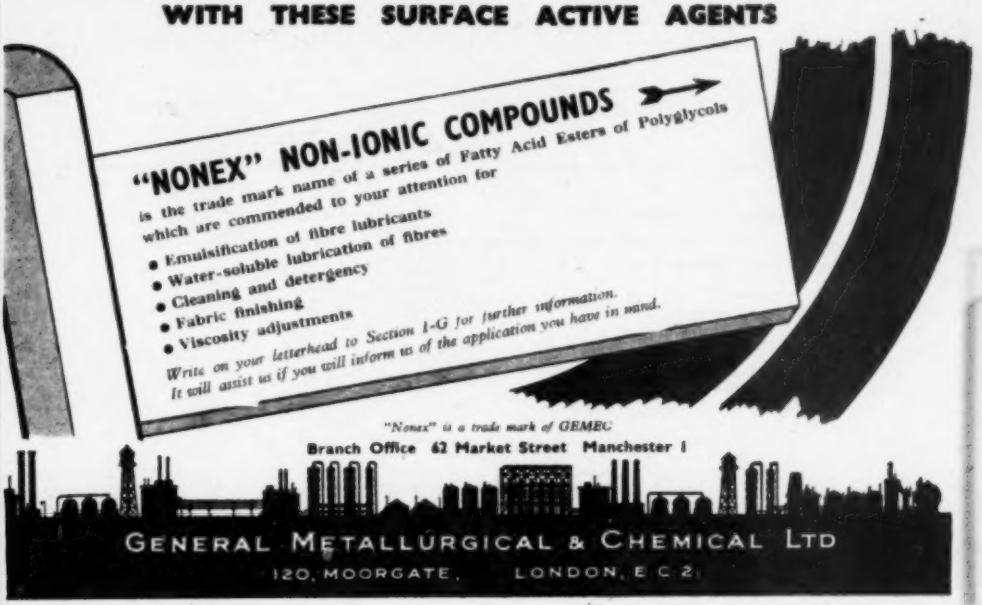
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Forthcoming Meetings of the Society

Friday—7th March 1952

Second George Douglas Lecture Dr. R. Hill *Synthetic Fibres in Prospect and Retrospect* Midland Hotel, Manchester

Friday—28th March 1952

ANNUAL GENERAL MEETING and DINNER of the Society Queens Hotel, Leeds

Friday—9th May 1952

Ninth Mercer Lecture Dr. F. C. Wood *Non-felting Wool and Wool Mixtures* College of Technology, Leicester

HUDDERSFIELD SECTION

All meetings held at Field's Café, Huddersfield at 7.30 p.m., unless otherwise stated.

1952

Tuesday 19th Feb. — F. Jordinson, Esq. *Defective Colour Vision*

Tuesday 18th March — Dr. C. B. Stevens *Some Observations on Dyeing Properties of Modified Wool*

Tuesday 8th April — ANNUAL GENERAL MEETING Dr. G. H. Lister (Sandoz Products Ltd.) *Acid and Chrome Dyes on Wool*

LONDON SECTION

All meetings held at 6 p.m. in the Rooms of the Royal Society, Burlington House, Piccadilly, London W.1, unless otherwise stated

1952

Friday 1st Feb. — N. Jackson, Esq. (Courtaulds). *Faults and Damages in Fabrics*

Friday 7th Mar. — Three short papers followed by a questionnaire on *Problems of the Garment Dyer and Cleaner*

It is also intended to hold a Dinner and Dance in the New Year, and to arrange for a lecture to be given in Luton in the spring, on a subject of interest to the hat industry. The date for the Annual General Meeting will be fixed later, for some time shortly after the last meeting of the session.

MANCHESTER SECTION

1952

Friday 15th Feb. — E. H. Waters, Esq. and H. Sumner, Esq. *The Effect of Soaping of Vat Dyes.* Gas Showrooms, Town Hall Extension, Manchester. 6.30 p.m.

Thursday 6th March — (Joint with the Textile Institute, Lancashire Section), Dr. A. Landolt (Ciba Ltd.) *Modern Developments in Textile Auxiliaries.* Textile Institute. 7 p.m.

Friday 21st March — Symposium on *Systems of Pack Dyeing.* Gas Showrooms, Town Hall Extension, Manchester. 6.30 p.m.

Friday 18th April — Annual General Meeting, details to be announced later. Gas Showrooms, Town Hall Extension, Manchester. 6.30 p.m.

Continued on page xxxiii

MIDLANDS SECTION

All meetings commence at 7 p.m.

1952

Friday 22nd Feb. — MIDLANDS SECTION DINNER Black Boy Hotel, Nottingham

Wednesday 27th Feb. — G. G. Taylor, Esq., B.Sc., A.Inst.P. *The Uses of Microscopy in Textile Dyeing and Finishing* (Joint Meeting with the British Association of Chemists). Midland Hotel, Derby

Wednesday 26th March — G. H. Lister, Esq., Ph.D., B.Sc. *The Influence of Dyeing Methods on Fibre Damage.* College of Technology, Leicester

Wednesday 23rd April — G. K. Mecklenburgh, Esq., S. Shaw, Esq., and H. W. Peters, Esq. *Some Developments in Setting and Finishing Nylon Textiles* (Preceded at 6.45 p.m. by the Annual General Meeting of the Section). King's Head Hotel, Loughborough

NORTHERN IRELAND SECTION

All meetings to be held in Queen's Hotel, Belfast at 7.30 p.m.

1952

Wednesday 13th Feb. — DISCUSSION EVENING

Thursday 6th March — R. C. McKinney, Esq. (Lilliput Laundry and Dyeworks Ltd.) *Commercial Laundering in Practice* (Joint Meeting with Textile Institute)

March — ANNUAL GENERAL MEETING and DINNER (date will be announced later)

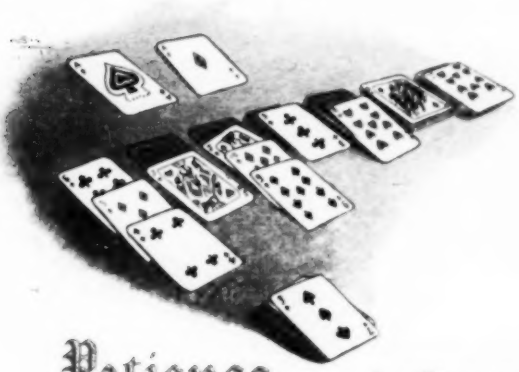
SCOTTISH SECTION

All meetings at 7 p.m., St. Enoch Hotel, Glasgow

1952

Tuesday 19th Feb. — R. A. Peel, Esq. *Turkey Red Dyeing in Scotland—Its Heyday and Decline*

Tuesday 18th March — ANNUAL GENERAL MEETING 7 p.m. LECTURE 7.30 p.m. J. Zonnenberg, Esq. *Recent Developments in Starch Products and their application to Sizing, Finishing and Printing*



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THE JOURNAL

OF THE

Society of Dyers and Colourists

Volume 68—Number 1 JANUARY 1952 *Issued Monthly*

OFFICIAL NOTICES

ELECTION OF OFFICERS AND MEMBERS OF COUNCIL

Under the revised Bye-laws which are now operative, Officers and Members of Council—other than the President and President-elect, who are nominated by Council and elected at the Annual General Meeting—are to be elected by a Postal Ballot of the members.

The attention of members is drawn to Bye-laws No. 12–17 inclusive and 20–26 inclusive, which relate to Officers and Members of Council respectively.

Nominations to be valid must be received by the Honorary Secretary of the Society at least six weeks prior to the date of the Annual General Meeting, which is on 28th March 1952.

MEMBERS AND JUNIOR MEMBERS

Persons desirous of joining the Society as Ordinary Members or Junior Members may obtain Application Forms from the General Secretary or from the Honorary Secretary of any Section of the Society. Applications must be proposed and seconded by members to whom the applicants are known personally. The annual subscription is £3 3s. 0d. for Ordinary Members and 15s. 0d. for Junior Members (below 21 years of age), payable on January 1st.

The *JOURNAL*

The *Journal* is posted free to all Members and Junior Members. Non-members can obtain copies on application to the Offices of the Society. All orders must be accompanied by a remittance of 6s. 8d. per copy (£4 0s. 0d. per annum post free). Back numbers of most issues of the Society's *Journal* can be supplied.

Members are reminded that under Bye-law 40 the *Journal* will not be forwarded to those who have not paid their subscription by 30th June 1952.

Members residing abroad are particularly requested to inform the General Secretary by separate post when sending their subscriptions by Money Order.

Communications on any subject related to the objects of the Society, especially such as are of an original character, are invited for consideration for publication in the *Journal*. Such communications in the first instance should be addressed to the Editor, Society of Dyers and Colourists, 32–34* Piccadilly, Bradford, Yorks.

General communications, including inquiries or orders for advertisements, should be addressed to the Offices of the Society, to which address all remittances should be sent.

REPRINTS OF LECTURES AND COMMUNICATIONS

Reprints of all lectures and communications are available after publication to members and non-members of the Society. The charges (postage included) are as follows—Single copies 2s. 6d. each; per dozen copies up to and including 8 pages, 12s. 6d., and for papers occupying more than 8 pages of the *Journal*, 17s. Orders should be addressed to "The Society of Dyers and Colourists, 32–34* Piccadilly, Bradford". They can be accepted only if accompanied by remittance and if received immediately after publication of the paper.

ABSTRACTS SECTION

Attention is drawn to the fact that copies of the Abstracts Section of the *Journal* printed on only one side of the paper, so that individual abstracts can be cut out and pasted on cards, are available at a charge of 30s. 0d. per annum. Orders should be sent to the Society's offices at 32–34* Piccadilly, Bradford, Yorks.

FREE ADVERTISEMENTS

For the convenience of members the Publications Committee allows a limited number of advertisements relating to SITUATIONS WANTED to be inserted in the *Journal gratis*. Such advertisements must not exceed 24 words in length.

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NOTICE TO AUTHORS OF PAPERS

The MSS. of all papers communicated to or read before the Society become the property of the Society. They should be addressed to the Editor, Society of Dyers and Colourists, 32–34* Piccadilly, Bradford, and should be accompanied by the "Schedule of Particulars", a copy of which may be obtained from the Honorary Secretary of any Section. Authors must not allow their papers to be published elsewhere before they have appeared in the Society's *Journal*. Should prior publication take place without the sanction of the Publications Committee, the paper will be printed only as an abstract or summary.

Manuscripts submitted for publication in the *Journal* should be typewritten (double spacing) on good-quality paper, using one side of the paper only and leaving a margin at least 1 in. wide on the left-hand side. The time taken in refereeing papers (both lectures and communications) will be reduced to a minimum when authors submit two copies of the typescript.

In view of the high costs of publication, it is essential that authors should be as concise as possible. When experimental procedure has already been published, a literature reference to the paper containing the details is sufficient, whilst well known experimental methods should be described very briefly.

Introductory paragraphs describing the aims of the investigation and the method of attack are desirable, and should be followed by the experimental results and their discussion. There should be a brief summary for insertion

* 19 Piccadilly from 11th February 1952

at the beginning of the paper. Centre headings should be employed sparingly. Side headings should be indented and underlined, and run into the text to which they apply by means of a dash. References to the literature should be numbered consecutively, using superscript numbers without brackets immediately following the text words or author's name to which they refer.

The list of references should be given at the end of the manuscript and the abbreviations used should be, as far as possible, those given in the "List of Periodicals Abstracted" included at the end of the Index to the preceding year's *Journal*. Reference numbers in this list should be neither enclosed in brackets nor followed by full-stops. As far as possible throughout the manuscript the abbreviations listed in the Jan. 1950 issue (p. 54) should be used. Tables should be numbered consecutively in Roman numerals and Figures in Arabic numerals.

The number of figures and graphs should be kept as low as possible, and data should be presented in the form of either tables or graphs, not both. Drawings should be carefully prepared, preferably in Indian ink, on plain white drawing paper or, preferably, Bristol board. In graphs, the frame and actual curves should be ruled and inked more heavily than any co-ordinate lines, and the latter should not be close together as in ordinary graph paper. Experimental points should always be given, and they should be indicated by small circles rather than by crosses in the case of a single graph, but where several graphs appear in a single Figure clear means of differentiation must be adopted. All numbers and legends are set up in type by the printer, and authors should therefore indicate them lightly in pencil.

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The Society subscribes to the Royal Society Fair Copying Declaration (J.S.D.C., **66**, 54 (Jan. 1950); **67**, 236 (June 1951)).

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Members of the Society may borrow books from the very extensive collection of works on pure and applied chemistry in the Library of the Chemical Society, by applying direct to *The Librarian, Chemical Society, Burlington House, Piccadilly, London W.1, and referring to their membership of the Society of Dyers and Colourists.* Letters on the subject should *not* be addressed to the Offices of the Society in Bradford.

DEPOSIT OF SEALED COMMUNICATIONS

I—The Society is prepared to receive from members and others and to keep as deposits, Sealed Communications dealing with any subject relating to the theory or practice of the Dyeing, Printing, and kindred industries.

II—Every deposit must bear on the cover a title for classification, the author's name, the date, and must be secured by a distinctive seal.

III—The deposit should be written in English, and, if it deals with machinery, be accompanied by sketches or drawings, or, in the case of dyeing or printing processes, by patterns.

IV—Every deposit will, unopened, be signed and sealed by the Honorary Secretary of the Society, immediately after receipt, and countersigned by another member of the Council.

V—The deposits will be numbered and entered into a special register, and an official receipt will be sent to the author.

VI—No charge will be made for registration and deposit.

VII—The deposits will be kept by the Society for a period of seven years. At the end of this period they will be opened and the contents read before the next meeting of the Council of the Society, and the contents, or an abstract thereof, may be published in the *Journal* of the Society at the discretion of the Publications Committee.

VIII—The author shall have the right to recall his deposit unopened at any time within the said seven years, or he may, at any time, order it to be opened and read before one of the Society's meetings. Such instructions must be accompanied by the official receipt.

IX—The Society will take every reasonable care of the deposits, but cannot be held responsible for their loss.

MEDALS AND AWARDS

HONORARY MEMBERS OF THE SOCIETY

1886–1915	*Sir H. E. Roscoe, M.P.	1931–1933	*Alfred Rée, Ph.D.
1902–1926	*F. H. Bowman, D.Sc., F.I.C., F.R.S.E.	1932–1940	*W. M. Gardner
1908–1916	*Prof. Dr. C. Graebe	1934–1947	*George Douglas
1908–1915	*Prof. Dr. C. Liebermann	1934–1946	*H. Grandage
1911–1916	*Prof. Adolf von Baeyer	1934–1940	*Christopher Rawson
1914–1924	*Count Hilaire de Chardonnet	1941–1948	*Prof. E. C. C. Baly, C.B.E., M.Sc., F.R.S.
1917–1941	*Arthur G. Green, M.Sc., F.I.C., F.R.S.	1944–1946	*Prof. F. M. Rowe, D.Sc., F.R.I.C., F.R.S.
1919–1938	*R. Vidal	1946–1946	*James S. Ridsdale
1921–1930	*Horace A. Lowe	1947	C. J. T. Cronshaw, D.Sc., F.R.I.C., M.I.Chem.E., F.T.I., F.R.S.E.
1923–1935	*Charles F. Cross, F.R.S.	1948	H. Jennison, M.C., A.M.C.T., A.R.I.C.
1925–1927	*Maurice Prud'homme	1950	George E. Holden, C.B.E., M.Sc., F.R.I.C.
1927–1930	*Ernest Hickson		
1928–1939	*R. E. Schmidt		

The following have been *ex officio* Honorary Members of the Society, the later dates indicating termination or change in title of the office—

1886–1920	The Worshipful Master of the Dyers' Company	1886–1900	The President, Bradford Technical College
1920–	The Prime Warden of the Worshipful Company of Dyers	1900–1905	*W. E. B. Priestley, Chairman of the Technical Instruction Committee of the Bradford City Council

*Deceased

THE PERKIN MEDAL

The Perkin Medal was modelled by the late F. W. Pomeroy, R.A., for the Society. It is an excellent presentation of the head of Sir William Perkin, the founder of the coal-tar colour industry, and President of the Society in 1907.

This medal is awarded for discoveries or work of outstanding importance in connection with the tinctorial arts.

LIST OF RECIPIENTS

1908 Professors Graebe and Liebermann. "Synthesis of Alizarin."
1911 Prof. Adolf von Baeyer. "Synthesis of Indigo."
1914 Comte Hilaire de Chardonnet. "Artificial Silk."
1917 Prof. Arthur G. Green. "Primuline."
1919 R. Vidal. "Sulphur Black."
1921 Horace Lowe. "Permanent Lustre on Cotton."
1923 Chas. F. Cross. "Discovery of Viscose."
1925 M. Prud'homme. "Aniline Black and Alizarin Blue."
1928 Dr. Robert E. Schmidt. "For Epoch-making Discoveries of Anthraquinone Derivatives and Dyestuffs therefrom."
1938 Dr. H. Dreyfus. "For Discoveries and Work of Outstanding Importance in Connection with the Development of the Cellulose Acetate Rayon Industry in England."
1938 J. Baddiley. "In recognition of his National Services for the Renaissance of the British Dyestuffs Industry through Many Important Investigations in the Field of Colour Chemistry Conducted or Directed by him."
1950 Prof. J. B. Speakman. "In recognition of his Outstanding Contributions to the Science and Technology of Textiles."

THE MEDAL OF THE SOCIETY OF DYERS AND COLOURISTS

This Medal was instituted by the Society in 1908. Of the competitive designs submitted, that of Mr. Edgar Lockwood was selected. The design indicates that the work of the dyer (centre figure) is both a science (right background) and an art (left foreground).

1908–1927 The Medal was occasionally awarded as a recognition of work of exceptional merit carried out under the Society's Research Scheme.

From 1928 The Medal was awarded as a recognition of exceptional services (*a*) to the Society or (*b*) in the interests of the Tinctorial and Allied Industries.

LIST OF RECIPIENTS

1908 J. B. Fothergill (Bronze Medal). "Treatment of Cotton to Cause it to Resist Direct Dyeing Colours."

1912 J. H. Garner (Silver Medal). "Treatment of Effluents from Dyehouses and Textile Factories."

1928 Ernest Hickson (Gold Medal). "Exceptional Services rendered to the Society as Chairman of the Publications Committee 1897–1925, and Chairman of *Colour Index* Committee."

1930 Arthur Silverwood (Gold Medal). "Exceptional Services rendered to the Society as Honorary Secretary 1913–1930."

1933 Prof. Walter M. Gardner (Gold Medal). "Distinguished Services as Editor of the Society's *Journal* 1900 to 1932."

1934 Prof. F. M. Rowe (Gold Medal). "Exceptional Services to the Society and to the Tinctorial Industries as Editor of the *Colour Index* 1924 and the 'Supplement' 1928."

L. A. Lantz (*Chairman*), H. H. Bowen, P. W. Cunliffe, R. S. Horsfall, Prof. B. A. McSwiney, C. C. N. Vass, C. M. Whittaker, S. G. Barker (Silver Medals). "Exceptional Services to the Society as Members of the Standardisation of Fastness Executive Committee."

1936 W. A. Edwards (Silver Medal). "Valuable Services rendered to the Society as Honorary Secretary of the Midlands Section since its inception in 1919 to 1935."

1937 R. Ritchie (Silver Medal). "Devoted and Valuable Services as Honorary Secretary of the Scottish Section for eighteen years."

1940 F. L. Goodall (Gold Medal). "Valuable Services to the Tinctorial Industries by his work on the Theory and Practice of Wool Dyeing."

1943 C. M. Whittaker (Gold Medal). "In recognition of Exceptional Services in promoting Scientific and Technical Knowledge amongst Textile Colourists, and for Sustained and Outstanding Service to the Society."

1946 H. H. Bowen (Gold Medal). "For Outstanding Services to the Society and in recognition of his Chairmanship of the Publications Committee for a period of twenty years."

H. H. Hodgson (Gold Medal). "For Outstanding Services to the Society and for his series of Sustained Experimental and Theoretical Contributions to those chapters of Organic Chemistry which are the essential scientific background to the Dyestuffs Industry."

E. Race (Silver Medal). "For his Valued Services to the Society as Joint Author of thirteen papers published in the Society's *Journal*."

H. Turner (Silver Medal). "In recognition of his Valuable Services to the Society and of his twenty-two years' service as Honorary Secretary of the Huddersfield Section."

Mrs. E. Cummings (*née* Levin) (Silver Medal). "For her Valued Services to the Society; by her assistance rendered in the preparation of the first *Colour Index*; by her Joint Authorship of a number of Papers published in the *Journal* of the Society, and as an Abstractor for the *Journal* of the Society for twenty years."

1947 Fred Smith (Gold Medal). "For Exceptional Services to the Society over a period of thirty-seven years comprising Chairman, West Riding Section; Member of Council and of many important Committees."

F. Scholefield (Gold Medal). "In recognition of Exceptional Services to the Society in the advancement of Tinctorial Technology both in theory and practice."

C. Schardt (Silver Medal). "In recognition of his Valuable Services to the Society over a period of twenty-four years including Chairman, Vice-Chairman, and member, of the Midlands Section Committee."

1948 G. G. Hopkinson (Gold Medal). "For Valuable Services rendered to the Society and to the Dyeing Industry."

D. B. F. McAndrew (Silver Medal). "For Valuable Services rendered to the Society as Honorary Secretary and Committee Member of the Scottish Section 1935–1947."

C. O. Clark (Silver Medal). "For Valuable Services rendered to the Society from 1923 to 1948."

1949 S. M. Neale (Gold Medal). "For his Pioneer Work in the Application of the Methods of Physical Chemistry to the Elucidation of the Phenomena of Dyeing, more particularly of Cellulosic Materials with Substantive Dyes."

1950 P. W. Cunliffe (Gold Medal). "For Outstanding Services to the Society and to the Tinctorial and Allied Industries."

H. Foster (Gold Medal). "For Outstanding Services to the Society."

L. A. Lantz (Bar attached to Silver Medal previously awarded). "For Exceptional Services to the Society and to the Tinctorial and Allied Industries in connection with Fastness Tests."

1951 W. Kilby (Gold Medal). "For Work on the Development of a Molten Metal Process of Continuous Dyeing."

THE WORSHIPFUL COMPANY OF DYERS RESEARCH MEDAL

The Medal represents the Arms of the Worshipful Company of Dyers of the City of London, which were granted in 1471. The following is a brief description—

Arms—Sable, a chevron engrailed argent, between three bags of madder of the last, corded or.

Crest—On a wreath three sprigs of the graintree erect vert, fructed gules.

Supporters—Two leopards rampant gardant argent, spotted with various colours; fire issuing from their ears and mouth proper, both ducally crowned or.

Motto—Da Gloriam Deo.

1—The Dyers' Company offer annually a Gold Medal called "The Worshipful Company of Dyers Research Medal", the award of which is open to the Authors of papers embodying the results of scientific research or technical investigation connected with the tinctorial arts submitted to the Society of Dyers and Colourists, and published in the *Journal* of such Society during the twelve months ending on the 30th June in the year for which the Medal is granted, and, in the special circumstance provided for by Rule 6, during the twelve months ending on the 30th June in the year previous to that for which the Medal is granted. If a paper shall be published in two or more parts, then for the purpose of the award of the Medal, all the parts together shall be treated as a paper published in the year in which the final part is published.

2—The Medal will not be awarded to the same person on more than one occasion.

3—The Society of Dyers and Colourists shall consider the papers available for the Medal and advise the Company as to the merits thereof, and if, in the judgment of the Society, none of the papers is of sufficient merit, the Society may recommend that the Medal be not awarded.

4—The Dyers' Company will award the Medal either to the Author of the paper which, in all the circumstances, appears to the Company to show the greatest merit, or, in the event of such paper being the work of an Author who

has already been awarded the Medal, to the Author of the paper next in order of merit who has not already been awarded the Medal, and may, if the Company so thinks fit, refrain from making any award.

5— In the event of a paper being the work of two or more persons, the Author shall be taken to be that one of them whose work in the opinion of the Society of Dyers and Colourists has most substantially contributed to the merit of the scientific research or technical investigation embodied in such paper.

6— In the event of the Author of a paper of sufficient merit published in the *Journal* of the Society of Dyers and Colourists during any twelve months for which the Medal is awarded being unsuccessful in obtaining the award of the Medal for that period, the Society of Dyers and Colourists may, in their discretion, consider such paper for adjudication with the papers available for the award of the Medal for the next succeeding twelve months.

LIST OF RECIPIENTS

1908	Prof. E. Knecht. "A Means of Estimating the Degree of Mercerisation in Cotton Yarns."
1909	Prof. Arthur G. Green. "The Chemical Technology of Aniline Black."
1910–11	R. L. Taylor. "The Action of Carbon Dioxide and of Air on Bleaching Powder."
1911–12	W. Harrison. "The Electrical Theory of Dyeing."
1912–13	S. H. Higgins. "Observations on the Bleaching of Cotton" and "The Action of Neutral Salts on Bleaching Solutions."
1913–14	W. Johnson (in conjunction with Prof. Arthur G. Green, who had already been awarded the Medal). "The Constitution of Aged and of Bichromate Aniline Blacks."
1914–15	Morris Fort. "The Mechanism of the Acid Dyebath."
1915–16	James R. Hannay. "The Interaction between Metallic Copper and certain Dyes of the Thiazine, Oxazine and Azine Series."
1916–17	Prof. H. M. Dawson. "The Phenomena of Acid Catalysis and the Theory of Acids."
1917–18	L. G. Radcliffe. "The Sulphonation of Fixed Oils."
1918–19	Chas. F. Cross (Diplomas presented to M. C. Lamb and C. V. Greenwood as co-authors). "Colloidal Tannin Compounds and their Applications."
1919–20	A. E. Everest (Diploma presented to A. J. Hall as co-author). "The Tinctorial Properties of some Anthocyans and certain Related Compounds."
1920–21	Prof. G. T. Morgan. "The Co-ordination Theory of Valency in Relation to Adjective Dyeing."
1921–22	S. Judd Lewis. "On the Fluorescence of Cellulose and its Derivatives."
1922–23	Prof. Arthur G. Green (Bar attached to Medal previously awarded), and K. H. Saunders. "The Ionamines— A New Class of Dyestuffs for Cellulose Acetate Silk."
1923–24	S. Judd Lewis (Bar attached to Medal previously awarded). "The Quantitative Determination of the Fluorescent Power of Cellulose and its Derivatives."
1924–25	Prof. F. M. Rowe (with Diploma to Miss E. Levin, as co-author). "The Identification of Azo Colours on the Fibre and of Azo Pigments in Substance."
1925–26	H. H. Hodgson. "Behaviour of the Sulphides of Sodium in Aqueous and Alcoholic Media", and "The Action of Sulphur on the Monochloranilines."
1926–27	Prof. F. M. Rowe (Bar attached to Medal previously awarded) and Diplomas awarded to collaborators— Miss E. Levin, A. C. Burns, J. S. H. Davies, and W. Tepper. "A New Reaction of Certain Diazosulphonates derived from β-Naphthol-1-sulphonic acid, leading to the preparation of Phthalazine, Phthalazone and Phthalimidine Derivatives."
1927–28	No award.
1928–29	F. Scholefield (with diplomas to Miss E. Hibbert and C. K. Patel as co-authors). "The Action of Light on Dyed Colours."
1929–30	H. H. Hodgson (Bar attached to Medal previously awarded). "Colour and Constitution from the Standpoint of Recent Electronic Theory."
1930–31	Prof. F. M. Rowe (Second Bar attached to Medal previously awarded), and Diplomas awarded to S. Ueno and F. H. Jowett as collaborators. "Insoluble Azo Colours on the Fibre and Action of Boiling Caustic Soda thereon."
1931–32	No award.
1932–33	Two awards— W. T. Astbury. "The X-ray Interpretation of Fibre Structure." J. B. Speakman. "The Structure of the Wool Fibre; its Relation to the Dyeing and Finishing Processes of the Wool Textile Trade."
1933–34	No award.
1934–35	H. A. Turner, and Diplomas awarded to G. M. Nabar and F. Scholefield, as co-authors. "The effect of Reduced Vat Dyes upon the Hypochlorite Oxidation of Cellulose."
1935–36	Prof. F. M. Rowe (Third Bar attached to Medal previously awarded), and Diplomas awarded to C. H. Giles, R. L. M. Allen, W. G. Dangerfield, and Glyn Owen, as collaborators. "Decomposition of Azo Dyes by Acids, Caustic Alkalis, and Reducing Agents."
1936–37	J. B. Speakman (Bar attached to Medal previously awarded), and Diplomas awarded to C. S. Whewell and J. L. Stoves, as collaborators. "The Reactivity of the Sulphur Linkage in Animal Fibres."
1937–38	Prof. F. M. Rowe (Fourth Bar attached to Medal previously awarded), and J. B. Speakman (Second Bar attached to Medal previously awarded), and Diplomas awarded to E. Race and T. Vickerstaff, as collaborators. "The Unlevel Dyeing of Wool with Acid and Chrome Dyes. Part I— The Reasons for the Uneven Dyeing Properties of Wool Staples and of Cloth Damaged by Exposure, and Part II— A Method for Correcting the Uneven Dyeing Properties of Wool Staples and of Cloth Damaged by Exposure."
1938–39	No award.
1939–40	T. H. Morton, as senior author of the paper on "Application of Vat Dyes to Viscose Rayon", by J. Boulton and T. H. Morton.
1940–41	No award.
1941–42	T. Vickerstaff, as senior author of the paper on "The Dyeing of Cellulose Acetate Rayon with Dispersed Dyes", by T. Vickerstaff and E. Waters.
1942–43	No award.
1943–44	J. Boulton. "The Importance of Dyeing Rate— an Interpretation for the Practical Dyer of Recent Research on Direct Dyeing."
1944–45	No award.
1945–46	No award.
1946–47	H. Phillips, as senior author of the paper on "The Chemical Constitution and Physical Properties of Bisulphited Wool", by E. G. H. Carter, W. R. Middlebrook, and H. Phillips.
1947–48	J. M. Preston, "Some Factors affecting the Dyeing of Viscose" and "Some Aspects of the Drying and Heating of Textiles".
1948–49	H. Lindley, as major contributor to the paper "The Mechanism of Set and Supercontraction in Wool Fibres", by S. Blackburn and H. Lindley.
1949–50	No award.
1950–51	J. Crank, "The Diffusion of Direct Dyes into Cellulose. III— The Present State of the Theory and its Application".

THE WORSHIPFUL COMPANY OF FELTMAKERS RESEARCH MEDAL

The Feltmakers' Company offer annually a Gold Medal for Papers embodying the results of scientific research or technical investigation connected with the art of feltmaking and published in the *Journal* of the Society. Further, in order to encourage research of a type likely to qualify for the award of the Medal, the Feltmakers' Company offer annually, for an initial period of five years, a Research Grant of £50.

January 1945–June 1946 No award.
July 1946–June 1947 No award.
July 1947–June 1948 No award.
July 1948–June 1949 No award.
July 1949–June 1950 No award.
July 1950–June 1951 No award.

KNECHT MEMORIAL FUND

A Fund of £100 was subscribed as a Memorial to the late Professor Edmund Knecht, from the interest on which two prizes, in the form of books, are awarded annually to selected students of the Manchester College of Technology and the Royal Technical College, Salford.

MERCER LECTURES

A sum of £20 per annum is being given to the Society for a limited period of years in commemoration of the centenary of the discovery of mercerisation. Suitable lecturers are invited to give a Mercer Lecture annually.

1944 N. G. McCulloch and G. S. Hibbert. "Science in an Old Industry."
1945 G. S. J. White, B.A., and T. Vickerstaff, Ph.D. "Colour."
1946 D. Entwistle, B.Sc., A.R.I.C. "Regenerated Fibres from Natural Polymers."
1947 E. J. Bowen, M.A., F.R.S. "Colour and Constitution—The Absorption of Light by Chemical Compounds."
1948 F. Farrington, B.Sc., F.R.I.C. "Textile Printing."
1949 E. Wilson, B.A. "Some Applications of Chemistry to Textile Finishing."
1950 A. B. Meggy, Ph.D., A.R.I.C. "Some Recent Developments in the Theory of Dyeing."
1951 D. Traill, Ph.D., F.R.I.C., F.T.I. "Some Trials by Ingenious Inquisitive Persons—Regenerated Protein Fibres."

GEORGE DOUGLAS LECTURE

A sum of £2000 was given to the Society by the Bradford Dyers' Association Ltd., the income from the investment of which is employed in providing a biennial lecture on some subject connected with the colouring or finishing of textiles.

1949 H. Levinstein, M.Sc., Ph.D., M.I.Chem.E., F.R.I.C. "George Douglas, His Times, and Some Thoughts on the Future."

Proceedings of the Society

Radioactive Tracer Techniques and their Applications in Industry

A. Robson

Meeting of the West Riding Section held at the Great Northern Victoria Hotel, Bradford, on 7th December 1950, Mr. C. O. Clark in the chair

Introduction

Before World War II the only radionuclides available were those occurring naturally, which had few applications as tracers, or those which were produced artificially, in machines such as the cyclotron, by the bombardment of nuclei with charged particles of high energy. The cyclotron-produced radionuclides were made in small quantities at high cost, and in consequence were used only by a few research establishments, chiefly in the U.S.A. However, the development of nuclear chain reactors during the past decade has made a great variety of radioisotopes available to scientists throughout the world.

Radionuclides have provided new stimulus in many fields of research, for by their aid problems have been investigated which could not possibly have been investigated by any other known experimental technique. They have found increasing application in the pure and applied sciences, and there can be little doubt that, as more workers become familiar with the techniques employed in handling them, their uses will expand rapidly. The mass of new knowledge already acquired from their use justifies the statement that they constitute "the most useful research tool since the invention of the microscope". At the present time more than 700 radionuclides are known, but the greater part of these are of purely academic interest and have little value as tracers for research.

Most of the radionuclides which can be made in a chain-reacting pile, and which are suitable for tracer work, are available from the Atomic Energy Research Establishment (A.E.R.E.) at Harwell.

Radioactivity

Radioactivity is a nuclear phenomenon; hence the term *radionuclide* is commonly used to describe any radioactive atom.

According to our present ideas the nuclei of all atoms consist of neutrons and protons, whose masses are approximately equal and close to unity. The neutron is uncharged, but the proton carries a positive charge, and the number of protons in the nucleus determines the atomic number of an atom. Since atoms are electrically neutral, they have extranuclear electrons equal in number to the nuclear protons. Only certain combinations of neutrons and protons form stable nuclei. A nucleus having a proton, or a neutron, more or less than the number required for a stable proton–neutron configuration is inherently unstable, and exhibits the phenomenon of radioactivity.

We may draw a crude analogy between an unstable nucleus and a volcano. Until a volcano reveals its presence by sudden eruption we have no idea that it is there. During eruption it throws up quantities of matter at high speed, and in addition gives off heat and light radiation. Some volcanoes, having once erupted, become extinct; others continue to erupt at irregular intervals. Likewise a radioactive nucleus, mixed with a large number of other nuclei, reveals its presence only at the moment of its disintegration, when it may emit a particle with a speed approaching that of light, and sometimes radiation besides. Certain types of radionuclides, having once disintegrated, become stable nuclei; others become new radionuclides which are capable of further disintegration. No one can predict when a volcano is likely to erupt, and it is certainly impossible to predict when a radioactive nucleus will be on the point of disintegration.

It was this fact which enabled E. von Schweidler to derive the fundamental law of radioactive decay, which may be stated mathematically thus—

$$N = N_0 e^{-\lambda t}$$

where N_0 is the initial number of atoms of radionuclide and N the number present after time t. When $N = N_0/2$, this expression becomes—

$$\tfrac{1}{2} = e^{-\lambda t_{\frac{1}{2}}}$$

or

$$t_{\frac{1}{2}} = \frac{\ln 2}{\lambda} = \frac{0{\cdot}693}{\lambda}$$

where $t_{\frac{1}{2}}$ is the *half-life* of the radionuclide. This is the main characteristic of a radionuclide, the physical significance of the half-life being that it is the time required for the activity of the radionuclide to decay to half its initial value.

Radiations Emitted by Radionuclides

The details of the different modes of decay of radionuclides do not concern us here, but we shall consider briefly the properties of the different kinds of radiation emitted, since it is on these properties that the methods of detection and estimation of radionuclides are based.

During disintegration a radionuclide may emit one, or more than one, of the following types of radiation—(*a*) α-particles, (*b*) β-particles, and (*c*) γ-rays.

(*a*) Alpha-particles are helium nuclei, carrying a positive charge of 2 and having a mass number of 4. The α-particles from any one radionuclide either all have the same energy, or fall into groups of discrete energies. They possess very high specific ionising power, producing about 30,000 ion pairs per centimetre of their paths in air. However,

they have ranges of only a few centimetres in air, and are easily stopped by thin sheets of paper.

It is of interest to note that, with the exception of samarium, all naturally occurring α-emitters have atomic numbers greater than 83, and for this reason their applications as tracers are not very widespread.

(*b*) BETA-PARTICLES are emitted by many radionuclides, sometimes as negatrons, or negative electrons, and sometimes as positrons, or positive electrons. β-Particles are not emitted with discrete energies, but with a continuous energy distribution from zero up to a maximum, the average value being roughly one-third of that of the maximum energy. The specific ionising power of β-particles is much less than that of α-particles, some 30–100 ion pairs being produced per centimetre of their paths in air. The penetrating power of these particles is much greater than that of α-particles, and thick sheets of aluminium are needed to stop the most energetic betas.

(*c*) GAMMA-RAYS are the sole radiation emitted by some radionuclides, but are usually emitted simultaneously with β- or α-particles. They are highly penetrating rays of low specific ionising power, of the order of 1 ion pair per centimetre of air path. Several inches of lead or several feet of concrete is needed to absorb the most energetic γ-radiation.

DETECTION AND MEASUREMENT OF RADIONUCLIDES

All methods for the detection and measurement of radionuclides are based on the fact that the radiations they emit ionise the matter through which they pass. Among the most important methods are— (1) photographic emulsion, (2) electroscope, (3) ionisation chamber, (4) Geiger–Müller counter, and (5) scintillation counter.

(1) It was through the use of the photographic emulsion that radioactivity was discovered, for in 1896 Henri Becquerel found that salts of uranium could "fog" emulsions although separated from them by paper wrapping. In recent years great advances have been made in the development of nuclear research emulsions, and emulsions are now manufactured which are capable of detecting all kinds of ionising particles from electrons to α-particles. Other types of emulsion, such as the no-screen X-ray emulsion, are used to prepare radioautographs, which reveal the distribution of a radionuclide in the subject autographed.

(2) The electroscope was among the earliest instruments used in radioactive assay, the rate of collapse of the gold leaves in the vicinity of a radionuclide being a direct measure of its activity. With the development of more sensitive detectors the electroscope fell into disuse, but at the present time the Lauritzen electroscope, a sensitive modification of the gold-leaf electroscope, is widely used in the U.S.A. for the routine measurement of radionuclides. Its sensitivity depends on the energy of the radiation emitted by the radionuclide, and is normally about one-fiftieth of that of the Geiger–Müller counter. It is not suitable for the estimation of γ-emitters.

(3) The ionisation chamber may be used to estimate α-, β-, or γ-emitters, but the last two are efficiently measured only in high-pressure chambers. The chamber consists of two electrodes with a potential difference of some 200 volts between them in an enclosed volume of some ionisable gas. The ionisation produced in the chamber by the radiations from a radionuclide gives rise to a small current, which can be amplified and recorded. An ionisation chamber used in conjunction with a sensitive electroscope is particularly suitable for the measurement of gaseous radionuclides, since these can be used as chamber fillings.

(4) The Geiger–Müller counter is the most widely used instrument in radioactive assay work at the present time on account of its extreme sensitivity and versatility. It consists of a thin tungsten wire anode and a coaxial cathode, and is usually filled with a 9 : 1 argon–alcohol mixture at a total pressure of 10 cm., although many different fillings are employed. The counter is provided with a thin window, through which ionising radiations may enter. It normally operates at an anode voltage of about 1200, the pulses it produces being independent of the initial ionisation; consequently it will give pulses equally well with α-, β-, and γ-radiation, provided a single ion pair is produced in the gas filling. However, since α-particles are not very penetrating and require extremely thin counter walls for efficient counting, the Geiger–Müller counter is used mainly with β- and γ-emitters. It is approximately 100% efficient for betas, but only about 1% for gammas.

(5) The scintillation counter is a modern development of the spinthariscope, used by Rutherford and his collaborators in the estimation of α-emitters and in determining α-particle ranges. In this type of counter the photons generated by a fluorescent material are converted by a photomultiplier tube to give pulses which are recorded by a scaling unit. When materials such as activated zinc sulphide are used, the counter is efficient for α-counting but totally unsuitable for β and γ, as the sulphide will not fluoresce when bombarded with these radiations. However, recent work has shown that large crystals of anthracene and naphthalene will fluoresce with β- and γ-radiation, and scintillation counters with high counting efficiencies are a distinct possibility in the near future.

In practice most tracer applications merely involve the determination of the relative activities of several samples of a compound labelled with a suitable radionuclide. These samples may be measured in the solid, liquid, or gaseous states. The prime essential is the exact reproducibility of the position of the active samples with respect to the measuring instrument. For gaseous samples this presents no difficulty, since they are normally used as fillings for ionisation chambers. This problem is also non-existent when counting liquid samples with the "fixed glass envelope" type of counter as illustrated in Fig. 1. A typical counting set-up for the radioactive assay of solid samples is shown schematically in Fig. 2. An electrode high-tension (E.H.T.) unit supplies a constant high

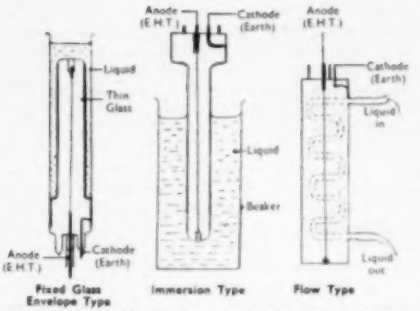

FIG. 1— Different Types of Geiger-Müller Counters for Liquids

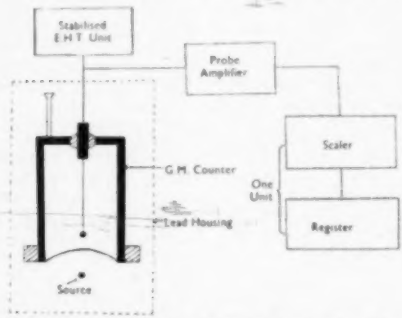

FIG. 2— Schematic Drawing of a Typical Counting Set-up for Radioactive Assay of Solid Samples

voltage of about 1200 v. to the anode of an end-window Geiger-Müller (G.M.) counter. The pulses from this counter are amplified by the probe amplifier and fed into the scaling unit, which registers each pulse received and sums the total number of pulses. The counter is surrounded by a thick lead housing or "castle" to reduce background counts to a steady minimum. The background counting rate is always subtracted from the counting rate obtained with the active sample. Solid samples are usually prepared as thin uniform layers of a suitable compound of the radionuclide on small, shallow trays of glass, aluminium, copper, nickel, silver, or some other metal. These trays are placed on a mount which can be accurately located beneath the G.M. counter for counting. For a pure β-emitter the rate of emission A is given by—

$$A = \frac{100C f_A f_s}{EG}$$

where C is the observed counting rate, G is the fraction of the solid angle enclosing the source subtended by the sensitive volume of the counter, E is the counter efficiency for β-particles, f_A is the factor for the absorption of β-particles in the source, the counter wall, and the air gap, and f_s the factor for the scattering of β-particles in the source, from the source mount, and from the surroundings. Because of the variables which have to be accurately determined, A is very difficult to measure, but in all tracer applications it is not necessary, since C is proportional to A provided the variables are maintained constant for all the samples measured.

Industrial Applications of Radionuclides

At the present time most of the radionuclides despatched from A.E.R.E. Harwell are used as tracers in medical and biological research, and in the U.S.A. only 3·5% of all shipments of radionuclides have gone to industrial users. The number of papers on the applications of radionuclides to industrial problems hitherto published has been small, but will no doubt increase as more workers become familiar with the techniques involved. Sufficient work has already been done, however, to emphasise that the two main rôles radionuclides have to play in solving industrial problems are (1) as sources of radiation and (2) as tracers for stable isotopes in chemical and physical processes.

1. AS RADIATION SOURCES

In the sheet metal, paper, and linoleum industries there has been a need for an instrument which would continuously monitor the thickness of material being produced, and which could operate a servo-mechanism to correct automatically deviations from a set standard. The β-ray absorption thickness gauge has been developed for this purpose. There are several types of instrument in use both in this country and in the U.S.A., but they all operate on the same principle, viz. the absorption of β-particles by matter. If several sheets of material of increasing thickness are placed successively between a β-particle source and a measuring instrument the reading on the instrument falls sharply as the thickness of material increases, the logarithm of the instrument reading being inversely proportional to the thickness of material interposed. One type of gauge (Fig. 3) consists of two

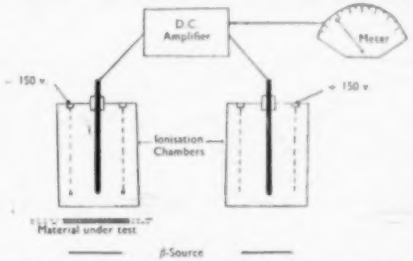

FIG. 3— One Type of β-Ray Absorption Thickness Gauge

identical ionisation chambers whose outer electrodes carry equal voltages of opposite polarity. The currents from the central electrodes are fed in opposition to a D.C. amplifier, which amplifies the resultant current to give a reading on a milliammeter. The currents from these chambers are directly proportional to the amounts of ionisation produced in them by the radiations from the two sources, of the same β-emitting radionuclide, placed close to their windows. The strip material under test, which must be of the thickness required, is guided between one source and its chamber, and a similar piece is placed between the second

chamber and its source, so that the milliammeter reads zero. The strip-rolling machinery is then set in motion, and any variation in thickness produces a corresponding variation in the milliammeter reading. Some useful β-emitting radionuclides which have been employed with this gauge, and enable a wide range of material thicknesses to be controlled, are carbon 14, sulphur 35, strontium 90, and thallium 204.

Some progress has been made in the use of radionuclides for the elimination of the electrostatic charges which develop on moving insulators, such as cloth and paper. The radiations emitted by radionuclides vary greatly in specific ionising power, α-particles having much greater ionising power than β-particles, whilst the latter have greater ionising power than γ-rays. Hence, we should expect a strip of metal coated with a thin layer of an α-emitter to be very effective in "killing" static. This is in fact the case, but it is essential that the strip should be situated at a distance of only a few centimetres from the source of static because of the short ranges of α-particles. Since it is not always convenient to have a strip so close to the moving material, most of the work done with static eliminators of the strip radionuclide type has been with β-emitters such as thallium 204. These have proved to be efficient where they have been tried, but γ-ray emitters are of no use for this purpose, as the activities required are precluded because of the health hazard.

In chemical manufacture it is often necessary to control the level of a corrosive liquid in a storage vessel. The intensity of γ-radiation from a "point" source of a radionuclide varies inversely with the square of the distance between the source and the measuring instrument, and this principle has been employed in designing the apparatus shown in Fig. 4 for controlling the liquid level. When the

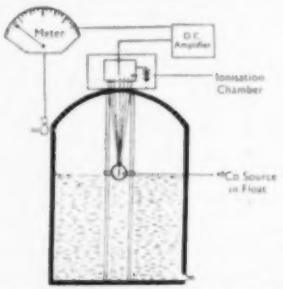

FIG. 4.—Schematic Drawing of a Liquid Level Control Device

liquid level falls, the float carrying the γ-source falls with it, and the reading on the instrument shows a corresponding drop. As soon as the meter reading reaches a preset lower limit, a servomechanism is set in operation which opens the stopcock at the inlet and more liquid runs in, the stopcock closing again when the upper limit is reached. Cobalt 60, or any γ-emitter of long life, can be used with this device.

In the petroleum industry scrapers are used to clean out miles of underground pipeline. The scrapers are forced along the pipe under pressure and often stick fast, when many man-hours are spent in locating them. A substantial reduction in time has been achieved by placing a small amount of cobalt 60 in the scraper, which can then easily be located by surveying the pipeline with a detecting instrument. When a new batch of petroleum is sent through the pipeline, it is advantageous to know when it reaches certain pipe junctions, and this is readily determined by incorporating some γ-emitting radionuclide in the first few cubic feet of petroleum and monitoring the junctions with measuring instruments.

Industrial radiography is a technique which has been used for many years in testing steel and alloys for flaws. γ-Ray sources of cobalt 60, iridium 192, and tantalum 182 are now available for the γ-radiography of steels. These sources are suitable for preparing radiographs of metals with thicknesses of 0·5–6 in., and are especially useful for taking radiographs of machinery which is not easily accessible to bulky X-ray equipment.

2. RADIONUCLIDES AS TRACERS

The isotopes of any one chemical element all have the same chemical properties, and, therefore, if one or more of these isotopes are radionuclides, they may be used as tracers for that element in chemical and physical processes. However, since isotopes have different mass numbers, caution must be exercised in using tracers especially of the light elements, when processes such as ion diffusion and distillation are being followed. Even in an experiment on the rate of diffusion of copper into silver sulphide a change in isotope abundance has been noticed. The relative abundances of the stable copper isotopes ^{63}Cu and ^{65}Cu are 70·1% and 29·9% respectively, but after sixteen hours' diffusion into silver sulphide at 450°C. they were found to be 71·2% and 28·8%. This difference is not large, and for many experiments may be less than the experimental error, but it is significant.

There are many problems in science which cannot be investigated without the help of tracers. Examples of such problems are the study of ion diffusion through membranes with no concentration gradient, and the numerous experiments on animal metabolism where the fate of a particular atom or molecule can be determined. Apart from these, the usual rôle of a radionuclide is as a sensitive analytical tool. Microanalytical methods such as polarography, colorimetry, and spectrography enable microgram amounts of elements to be determined with fair accuracy, but radiochemical techniques permit the estimation of amounts as low as 10^{-9} g., and in some favourable cases much smaller amounts.

Piston wear in internal combustion engines has been investigated by plating the piston rings with radiochromium ^{51}Cr. The amount of chromium removed during engine working was determined by taking a radioautograph of the cylinder lining, and it was found that most of the chromium rubbed off was concentrated on that part of the cylinder corresponding to the end of the piston stroke where

the amount of lubricant was least. This method is applicable to any system where metal surfaces rub together in the presence of lubricant, and has already yielded valuable information on bearing wear and the most suitable lubricants to use to prevent excessive wear. A similar tracer technique has been used in dry friction studies at the Massachusetts Institute of Technology, and from these it appears that even with the hardest working surfaces some metal transfer accompanies friction.

It is of interest to marine engineers—and to paint manufacturers—to know the rate at which sea-water attacks and penetrates the paint on a ship's hull. This problem has been investigated in the laboratory by incorporating a radionuclide in the sea-water, and accurate data have been obtained without recourse to the costly testing methods used previously.

The uniformity of distribution of a lubricant on fibres after textile finishing has been determined by mixing sodium oleate containing radiosodium ^{24}Na with the lubricant. Radioautographs of the fibres revealed a high degree of uniformity. Similar research has been carried out on the distribution of oil on textiles during processing by adding ethylene dibromide containing radiobromine ^{82}Br to the oil used and determining its distribution by a counting method.

Further examples of the use of radionuclides as tracers in industrial research are given in the reviews by A. P. Schreiber [1], H. D. Taylor [2], and J. W Irvine, Jr.[3].

In conclusion, mention must be made of the technique of *radioactivation analysis*, which, whilst still in its infancy, is likely to prove increasingly useful in the estimation of traces of elements. The following example will serve to illustrate the general principle of the technique. Let us suppose that a minute quantity of copper is suspected of having caused a fault in a finished fabric and it is necessary to know the amount present. A sample of the fabric is placed in an aluminium can, and a small weighed amount of pure copper is put in a similar can. The two cans are irradiated together in an atomic pile at the same neutron flux for the same period of time. On removal from the pile a few milligrams of copper, in the form, say, of cupric chloride, is added to the irradiated fabric. This is then submitted to a conventional analytical procedure for the separation of copper as copper sulphide. The added copper on precipitation will carry with it the radiocopper ^{64}Cu, produced by neutron bombardment in the pile. The activity of this precipitate may then be compared with that of a similar precipitate prepared from the pure copper sample irradiated. Thus the trace amount of copper in the original fabric can be determined.

Whether it is feasible to detect a trace of an element by this method depends on a number of factors, which for the example cited are all favourable. These factors are clearly defined and the technique of radioactivation analysis is fully discussed in a paper by G. E. Boyd [4].

* * *

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Discussion

Mr. R. Heaton: Are strips of radioactive material of practical use in the elimination of static in worsted drawing?

Dr. A. Robson: A small amount of research on the use of these strips in eliminating static in worsted drawing is being carried out in this country, but no details can be given. The radioactive strips have certainly proved effective in destroying static in other industrial processes.

Mr. E. Stead: Incorporation of a radioactive substance in a finish has been suggested to overcome the problem of static in handling textiles, especially nylon. Is this a practical proposition?

Dr. Robson: Introduction of any radioactive substance, even though it be short lived, into manufactured textiles which will subsequently be handled by many people is a most undesirable procedure. Moreover, if it were adopted as standard industrial practice, contamination of machinery could not be avoided, and precautions would have to be taken to safeguard the health of operatives. The radioactive strips already described seem to be a more practical way of solving the problem, as fairly large amounts of radionuclides can be concentrated on them with the minimum of risk.

Mr. L. Chesner: Has the β-ray thickness gauge been used in the plastics industry, and can the lecturer give any information about the availability and price of the instrument?

Dr. Robson: The gauge is in use in the plastics industry both here and in the U.S.A. At present there are three British versions of the instrument on the market, and their prices are in the region of £200–250.

Mr. C. O'Briain: Could radioactive tracer techniques be used to measure the rate of diffusion of dyes into fibres?

Dr. Robson: This is the sort of problem which lends itself to investigation by tracer techniques. I believe some workers in the U.S.A. have already started work on the rate of dye uptake by fibres using radioactive tracers. At Torridon we are using ^{24}Na and ^{82}Br as tracers for sodium and bromide ions in analogous diffusion experiments.

Dr. P. W. Cunliffe: In applying radioactive copper to the study of the distribution of metals in wool in such processes as mordanting, what is the minimum detectable amount of copper?

Dr. Robson: Radiocopper ^{64}Cu has a fairly short half-life of 12·8 hr. Providing it is measured within 3–4 days of its creation in the Harwell pile, 10^{-9} g. can be detected, and amounts of the order of 10^{-7} g. can be estimated with ease.

An Electron Microscope Study of the Surface Structure of Wool

R. L. Elliott and B. Manogue

Meeting of the West Riding Section held at the Great Northern Victoria Hotel, Bradford, on 22nd February 1951, Mr. E. A. Swift in the chair

The mode of dye absorption and retention by wool is determined by the properties, condition, and state of the various histological phases of the fibre. Several optical and electron microscope investigations [1–9] have shown these phases to comprise—

(1) A complex cuticular layer, composed of (*a*) epicuticle, (*b*) exocuticle, (*c*) endocuticle [10].

(2) The cortical cells, which are composed of fibrils and microfibrils embedded in an amorphous matrix and thus contain both ordered (crystalline) and disordered (amorphous) keratin.

(3) An intercellular cementing substance is also believed to be present.

(4) In the case of medullated fibres, non-staining medullar cells are present.

The tendency to stress the disulphide bond participation, despite the now recognised variation of sulphur content within single fibres, from root to tip, within the single lock, from fibre to fibre, from fleece to fleece, and from type to type of wool, has resulted from the acceptance of the uniform chemical nature of wool. It is possible that there is very little or no sulphur in either the exocuticle or the cementing matrix. Certainly the epicuticle, from its resistance to sodium sulphide, is not of the disulphide type, and seems almost certainly non-protein in nature.

The evidence for the existence of the epicuticle, other than that afforded by the electron microscope [6–7], can be summarised—

(*a*) Royer [11] has shown that in the early stages of dyeing there is annular penetration of the dye followed by a slow diffusion of the dye between and into the cortical cells. Certainly penetration at discontinuities of some outer layer is required for dye absorption.

(*b*) Whewell and Woods' Methylene Blue test for wool damage [12].

(*c*) The Allwörden reaction [13].

The felting of wool depends on fibre migration, which in turn depends on the frictional properties and elasticity of the fibre. All established commercial methods of rendering wool non-felting affect one or other of these properties. Some newer resin treatments are said to act by glueing the fibres together.

Lindberg and Gralén [14] showed, from frictional measurements with the twist friction meter, that the first attack of chemical agents is restricted to the cuticle, and that attack of the cortex requires much more vigorous treatment. Thus alcoholic potash treatment gave only superficial attack of the fibres. Gralén states that the low friction of undamaged wool is due to the epicuticle. Removal of this layer reveals a surface with different frictional properties. That is to say, disorientation of the surface structure of the fibre appears necessary for the production of non-felting wool by chemical methods.

In the present electron microscope study a replica technique has been used to investigate the effect of various non-felting treatments, in so far as the surface structure of the fibre is concerned. Mercer and Rees [1] examined wool treated with sulphuryl chloride, and showed that the tips of the scales had been modified by the treatment, but they did not show whether a change of the whole surface had occurred. The present work now shows conclusively that there is a definite change of the whole surface, and confirms the heterogeneous physical (and probably chemical) structure of the cuticle of wool, indicating also some difference between the effect of chlorine and alcoholic potash treatments.

The electron micrographs show that—

(1) The surface of the scales of undamaged wool is smooth (Fig. 1). In some places on Fig. 1 very faint longitudinal striations can be detected. (The black particles are dirt.)

(2) Treatment with papain removes part of the cuticle, for the striated, more resistant endocuticle is revealed (Fig. 2).

(3) Potassium hydroxide in a n-butyl alcohol–paraffin mixture causes only slight change in the surface (Fig. 3 and 4). No rounding-off of the scale edges has taken place. Fig. 4 shows the scale formation clearly, and a "double edge" can be seen. This effect is found because one "edge" is due to contact of one scale with the next, while the second is the true edge of the overlapping scale.

(4) Following a mild treatment with hypochlorous acid (1% chlorine on the weight of wool), the striations can be detected uniformly over the whole surface (Fig. 5).

(5) A more severe acid chlorination (3% chlorine on the weight of wool) causes a pronounced change. Fig. 6 shows that the surface is composed of deeply striated and also very smooth regions. Places corresponding to the scale edges can just be detected. The nature of the ridged surface is more clearly revealed in Fig. 7, an enlargement of part of Fig. 6. Some treated fibres show a different kind of surface (Fig. 8). Here part of the edge of a scale is shown: probably this vesiculate structure has been formed in the preparation of the replicas.

(6) After soap milling of acid-chlorinated wool, all scale structure is often lost (Fig. 9). The coarse ridges are probably impressions of cortical cells.

(7) Commercially dry chlorinated wool shows the striated surface characteristic of the endocuticle (Fig. 10 and 11). The striations appear deeper at the lower part of each scale, which suggests that the layer of less resistant material, partly removed, is thicker towards the scale tips.

Electron Micrographs of Polystyrene-Aluminium Replicas

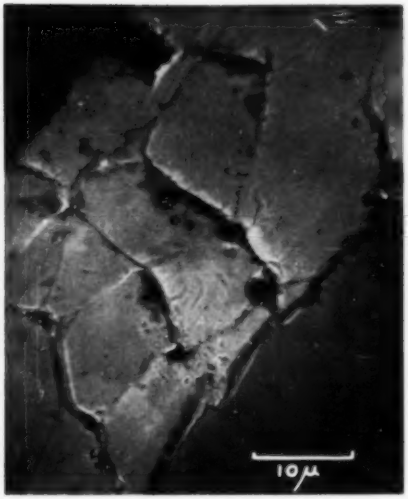

FIG. 1 — Undamaged Wool (gold-shadowed)

FIG. 2 — Papain-treated Wool

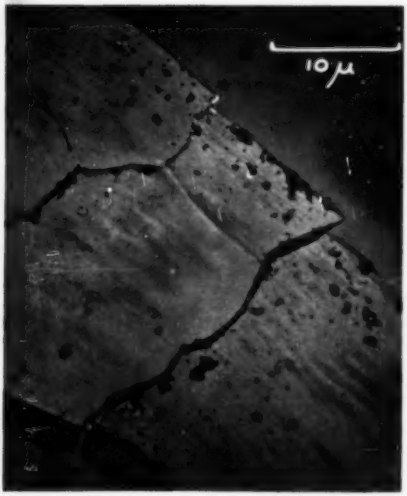

FIG. 3 — Wool treated with Alcoholic Potash

FIG. 4 — Wool treated with Alcoholic Potash

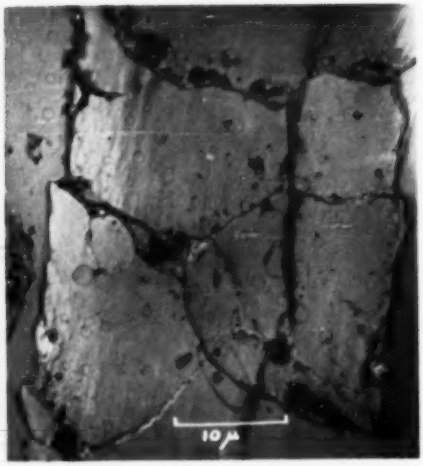

Fig. 5.—Wool treated with Hypochlorous Acid (1% chlorine on weight of wool)

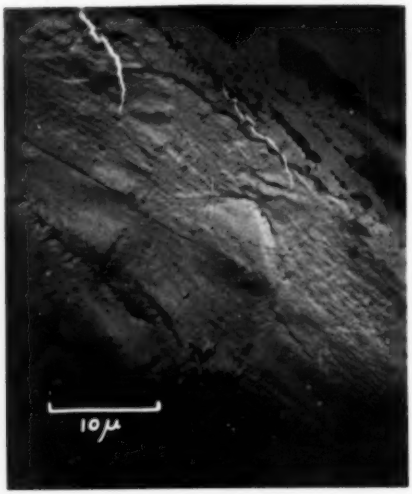

Fig. 6.—Wool treated with Hypochlorous Acid (3% chlorine; gold-shadowed)

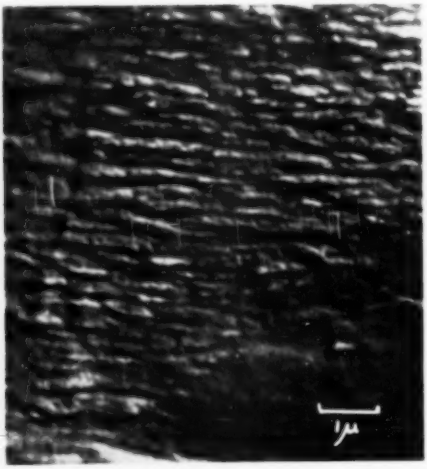

Fig. 7.—Part of Fig. 6 reversed photographically and enlarged optically; gold-shadowed

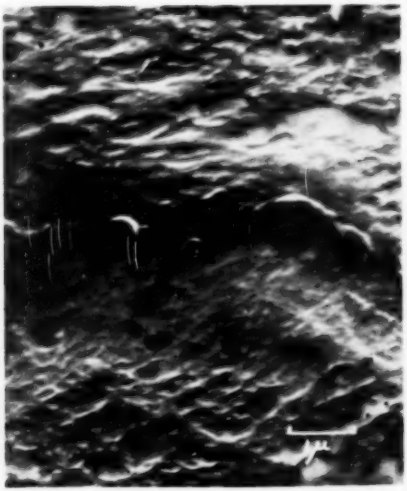

Fig. 8.—Wool treated with Hypochlorous Acid (3% chlorine; reversed photographically)

FIG. 9— Wool treated with Hypochlorous Acid (3% chlorine) and milled with Soap

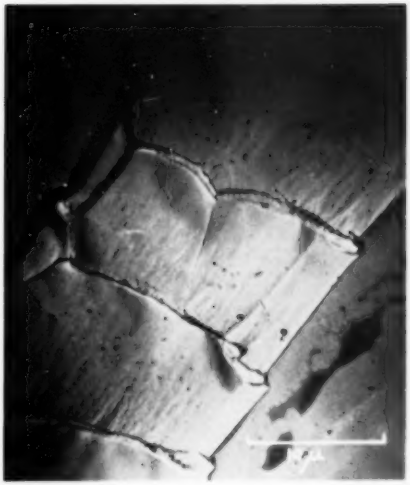

FIG. 10— Commercially Dry Chlorinated Wool (0·7% chlorine)

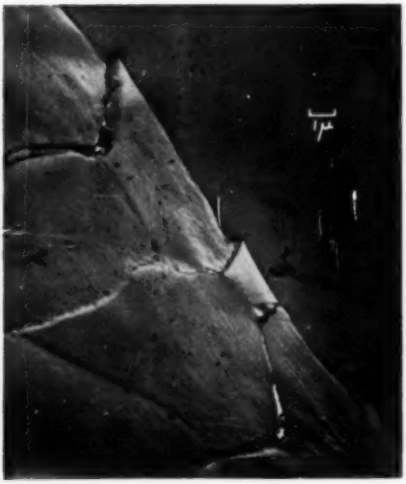

FIG. 11— Commercially Dry Chlorinated Wool (0·7% chlorine)

FIG. 12— Commercially Dry Chlorinated Wool (0·7% chlorine) after Soap Milling

FIG. 13— Negafol-treated Wool

FIG. 14— Chlorazyne-treated Wool

FIG. 15— Material resistant to Peracetic Acid–Ammonium Hydroxide Treatment

FIG. 16— Material resistant to Peracetic Acid–Ammonium Hydroxide Treatment

(8) After hand-milling some of the dry chlorinated wool with soap, parts of the cuticle are stripped off (Fig. 12).

(9) Negafel-treated wool appears similar to dry chlorinated wool (Fig. 13).

(10) Chlorzyme-treated wool is almost completely devoid of scales (Fig. 14).

In none of the cases examined is the action of the reagent confined to the scale tips, but a change in the whole surface of the cuticle is found to have occurred.

On some replicas, when the cuticle has been removed either partly or completely, there seems to be a smooth surface similar to that shown by Swerdlow and Seeman [4], and by Makinson [6]. As several claims have been made of isolating a subcuticular membrane from wool [15–17], an attempt was made in this work to isolate such a membrane. Wool was treated therefore with an aqueous solution of peracetic acid followed by 0·1 N. ammonium hydroxide solution as recommended by Alexander and Earland [17]. Difficulty was encountered in completely removing all the cortical cells, and when the isolated material was stained with methylene blue and examined under an optical microscope, scale markings were visible on the swollen sheath of material. Electron microscope examination of part of the material supported on a cellulose nitrate film suggests that some of this material is the epicuticle (Fig. 15) with much other material; parts of the exo- and endo-cuticle and cortical cells were also present (Fig. 16).

The chemical nature of the epicuticle is still a matter of hypothesis. It differs considerably from that of the endo- and exo-cuticle of the cortical cells and of the matrix. It is almost certainly not protein. Gralén [18] postulated at one time a polysaccharide, similar to that of the capsules of bacterial spores.

As an alternative it is now postulated that, since wool grease contains large quantities of cholesteryl esters and other steroid esters which are deposited from the sebaceous gland around the wool fibre inside the follicle, the epicuticle is a sterol complex. Such resistant steroid deposits are known (e.g. gallstones), and reaction between sterols and thiol sulphur and other groups of the exocuticle within the follicle may lead to formation of the water-repellent layer which has been generally accepted as the epicuticle.

Experimental Procedure

1. Treatment of Wool Fibres

The tips were removed from locks of a sample of 64s-quality Australian merino wool, the grease was extracted from the remainder by refluxing for 4 hr. with diethyl ether, followed by ethyl alcohol, and the wool was subsequently washed in several changes of distilled water. Fibres were selected as samples of undamaged wool.

Papain

Loose wool, previously extracted, was treated with a solution containing 0·025% papain, on the weight of wool, in a 1% solution of sodium bisulphite, buffered to pH 6·7 with sodium carbonate, for 30 min. at 65°C. The wool was then immediately rinsed in hot distilled water, followed by several changes of cold distilled water.

Caustic Potash in n-Butyl Alcohol–Paraffin

Wool (15 g.), previously extracted and dried, was treated with 150 c.c. of a solution of 7·1 g. of potassium hydroxide in 100 c.c. of n-butyl alcohol diluted with 900 c.c. of paraffin, for 30 min. at 35°C. The wool was then rinsed in paraffin, immersed in 300 c.c. of 0·1 N. sulphuric acid for 5 min., and finally washed in running tap water (pH 9) overnight.

Hypochlorous Acid

(*a*) 1% Chlorine on Weight of Wool—Wool (10 g.), previously extracted, was wetted out with water and shaken vigorously in a bottle with a solution consisting of 56·2 c.c. of 0·05 N. sodium hypochlorite, 500 c.c. of distilled water, and 0·3 c.c. of glacial acetic acid. The temperature was 18°C. and the pH 4·3. The hypochlorous acid was exhausted in 10 min. The wool was then rinsed with 1% sodium bisulphite solution, warm distilled water, and several changes of distilled water.

(*b*) 3% Chlorine on Weight of Wool—Wool (15 g.), previously extracted, was wetted out with water and shaken in a bottle with a solution consisting of 181 c.c. of 0·07 N. sodium hypochlorite, 900 c.c. of distilled water, and 2·0 c.c. of acetic acid. The chlorine was exhausted in 23 min. The temperature was 18°C. and the pH 4·0. The wool was then rinsed in 1% sodium bisulphite solution, warm distilled water, and several changes of distilled water.

2. Preparation of Specimens for Electron Microscope Examination by Replica Method

An impression of the fibres was first made on a polystyrene-coated glass slide. Usually about twenty fibres were laid in one direction on the coated slide, with a few fibres lying across them. The fibres were then covered by a clean microscope slide. The slides, protected by pieces of cardboard, were then clamped in a laboratory clamp and warmed in a thermostatically controlled oven at 85°C. for 20–25 min. When cold, the slides were unclamped, and the fibres easily removed from the polystyrene by gentle manipulation. If the cast appeared satisfactory when examined under an optical microscope, a positive replica was made, by the vacuum evaporation of aluminium, normally to the cast. The double film of polystyrene and aluminium was then scored into small squares (0·5 cm. side) with a razor blade, and selected pieces were floated, aluminium side downwards, on to a solution of benzene in a Petri dish. The polystyrene quickly dissolved, and the small pieces of aluminium film, which carried a replica of the fibres, were washed in benzene for about 5 min., and then collected and examined.

In many cases the contrast of the specimen was enhanced by gold shadowing [19] the mounted aluminium films.

The instrument used was a Metropolitan-Vickers EM/2 electron microscope. Generally, low magnifications of the instrument were employed, so that as great an area as possible of the replicas could be viewed.

The electron micrographs are positive prints; i.e. on shadowed replicas the shadowed areas appear light, except for Fig. 7 and 8, which have been reversed photographically.

* * *

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Discussion

Dr. C. S. WHEWELL: In view of the ease of removal of the epicuticle, it is doubtful whether it could have any bearing on the subsequent behaviour of the fibre.

Dr. ELLIOTT: Whilst the epicuticle is easily punctured and damaged, such punctures are necessary for ease of penetration of dye molecules. During normal preliminary processes such as mechanical treatment in carding and combing just such localised damage may occur to a limited extent, without reducing the thickness of the epicuticle in undamaged areas. Non-shrink processes, however, as demonstrated, may either reduce the overall thickness of the epicuticle, or remove it completely. In the former case ease of penetration of dye is certainly facilitated, and in the latter no impeding barrier is left.

Dr. WHEWELL: Are the crystalline and amorphous regions clearly defined?

Mr. W. R. MOORE: It is quite possible for small molecules to enter both amorphous and crystalline regions of a fibre. Thus with cellulose nitrate, Mathieu and Petitpas have shown that ketones and acetates of smaller molecular size enter crystalline regions. It is not entirely a question of molecular size, as alkyl nitrates apparently do not enter crystallites. In the dyeing of wool by acid dyes, it is quite possible for hydrochloric acid to enter all regions of the fibre, though large dye molecules may enter only amorphous regions, just as direct cotton dyes enter only amorphous regions of cellulose. The amorphous and crystalline regions of a fibre should be regarded as limiting types of chain arrangement rather than distinct and separate types.

Mr. S. CHAPMAN: Is it suggested that the sebaceous gland virtually puts a natural waterproof coating on the fibre as it emerges from the fibre sheaf, and is it separate from the main body of the fibre or chemically attached to it?

Dr. ELLIOTT: It is put forward as a hypothesis, based on the work in its present state, that such a layer of water-repellent material may be so deposited, and that this may be attached by physical or physicochemical forces, or even by chemical bonds.

Mr. J. V. SUMMERSGILL: The electron photomicrograph illustrating wool treated by the Negafel process (Fig. 13) shows that the scale structure was retained to a certain extent. On the other hand that illustrating wool treated by wet chlorination (Fig. 6) shows the scale structure to be largely removed. Is there any explanation for the difference?

Dr. ELLIOTT: The sample of Negafel-treated wool was a commercial sample. That of wet chlorination had been drastically treated deliberately in the laboratory. Whilst normal commercial wet chlorination would not show such drastic action on the cuticle, it is still possible, as claimed by the patentees, that the Negafel process is less damaging to the cuticle, as the photographs show.

Some Developments in Dispersed Azo Dyes for Cellulose Acetate Rayon and Nylon

E. Stead and A. Murray

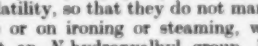
Summary of a lecture to the Scottish Section at the St. Enoch Hotel, Glasgow, on 23rd January 1951, Mr. D. B. F. McAndrew in the chair

A large number of widely used disperse dyes for cellulose acetate are based on 4-amino-4′-nitroazobenzene, i.e. Celliton Fast Orange GR (IG) [1,2]. Particularly useful are members with either one or two *N*-hydroxyalkyl groups; e.g. the compound—

is Serisol Fast Scarlet GD. Elaborations on this structure give a range of bluer scarlets, reds, crimsons, and violets, and blues can be made by using as coupling components such complex *N*-hydroxyalkylated amines as 1:2:3:4-tetrahydro-1′:3-dihydroxy-7:8-benzoquinoline [3,4]. These dyes with *N*-hydroxyalkyl groups are invariably of very low volatility, so that they do not mark off during storage or on ironing or steaming, whereas dyes without an *N*-hydroxyalkyl group, like Celliton Fast Orange GR, are so volatile as to make them unsuitable for printing processes where the fabric has to undergo a steaming operation.

When applied to nylon, the 4-amino-4′-nitroazobenzene dyes invariably give dull shades of somewhat lower fastness to light than the shades on acetate rayon. Nevertheless, the scarlets and reds are being widely used for nylon because of their ease of application and the reliability of the results they produce.

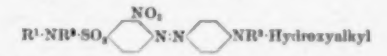
In this investigation dyes were made in which the *para*-nitro group common to the above series of dyes was replaced by a sulphamyl or substituted sulphamyl group, viz. $SO_2{\cdot}NR^1R^2$ (R^1 and R^2 = H, alkyl, or hydroxyalkyl; or R^1 and R^2 together = alkylene). The simplest member was—



which dyed acetate rayon bright yellowish orange. Although the shades produced were slightly less fast to light than those given by Celliton Fast Orange GR, and exhibited some phototropism, they were quite fast to marking-off on ironing or steaming. Slight elaborations of this structure, such as a halogen substituent *meta* to the sulphamyl group, a methyl group *meta* to the amino group, or the replacement of one of the hydroxyethyl groups by an unsubstituted alkyl group, gave redder oranges with very similar properties.

When applied to nylon the new dyes gave oranges practically as bright as the shades they gave on acetate rayon, so that dyes of this type present the possibility of dyeing and printing both acetate rayon and nylon in bright oranges, fast to marking off, in contrast to the results obtained with previous commercial types, which were volatile and dyed nylon in dull shades.

The next step was to attempt further elaboration of the structure in order to produce bright scarlets and reds for nylon, it being well known that existing available disperse dyes give dull shades on this fibre. The types of elaboration investigated fall broadly into two main groups—(*a*) an *ortho*-nitro group was introduced into the diazo component, to give a general structure—



(R^1 and R^2 as above; R^3 = alkyl or hydroxyalkyl); and (*b*) *N*-hydroxyalkylated derivatives of *α*-naphthylamine were used as coupling components to give structures—

Both types did give bright scarlets and reds on nylon, the dyes of type (*b*) giving particularly attractive shades, perhaps because they contain no nitro group. However, previous experience with dispersed monoazo dyes with a naphthalene nucleus in the coupling component led us to expect very poor light fastness from the (*b*) type, and in fact, dyeings on acetate rayon were found to be extremely fugitive. But, most surprisingly, the dyeings on nylon had good fastness to light, at least as good as fastnesses normally given on nylon by existing dispersed azo dyes. In terms of the S.D.C. scale (*B.S.* 1006) the fastness to light on acetate rayon is much less than 1, whereas on nylon, ratings around 4 to 5 are not uncommon.

A dye of this type is clearly not suitable for acetate rayon, so it is omitted from the Serisol range; instead it is included in the Serinyl range, denoting a dispersed dye designed specially for nylon. It should be noted, however, that the Serinyl range does include colours such as grey, green, brown, and navy blue which, although designed particularly for nylon, may possess satisfactory light fastness on acetate rayon.

Further investigation has indicated that the property of poor fastness to light on acetate rayon and good fastness on nylon is common to monoazo dyes made from *α*-naphthylamine or its *N*-substituents as coupling components with aniline, chloroanilines, chlorotoluidines, nitroanilines, and chloronitroanilines as diazo components.

No clue has been afforded during the investigation as to the mechanism of the rapid degradation of these dyes by light when they are dyed on cellulose acetate. But the bare facts do emphasise in

a striking way that studies of light fastness must not underestimate the part that may be played by the substrate.

* * *

The authors thank the Yorkshire Dyeware & Chemical Co. Ltd. for permission to publish this summary.

YORKSHIRE DYEWARE & CHEMICAL CO. LTD.
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COMMUNICATION

Diazo Compounds in the Determination of Wool Damage

M. V. GLYNN

An investigation has been made into the possibility of using the Pauly test for the quantitative estimation of wool damage. Rapid decomposition of aqueous solutions of diazo compounds, resulting in the formation of coloured azo compounds within wool fibres, has been observed. Such colour development can occur in undamaged fibres, leading to false conclusions. Other diazo compounds have been investigated, and it has been found that diazotised *o*-nitroaniline is considerably more stable than diazotised sulphanilic acid and gives reproducible results when used to measure damage. Preliminary work using the modified test indicates that a single test of this type is incapable of detecting or measuring all types of damage.

One of the methods available for the determination of wool damage is the Pauly test, which depends on fibre coloration as a result of a wool–diazo coupling reaction. It was first proposed by Pauly and Binz [1], who found that fibres having a degraded scale-structure developed a reddish-brown coloration on treatment with alkaline diazotised sulphanilic acid, whereas normal undamaged wool fibres showed no such colour.

Although the test was originally intended only as a qualitative means of damage detection, attempts have subsequently been made to render it quantitative, possibly the most widely known being the Rimington modification [2]. Examination of this test by Whewell and Austerlitz [3], however, led them to conclude that it was unsatisfactory as a quantitative test and suitable only for qualitative detection.

During the course of a further examination of the Rimington modification, it has now been found that colour can be developed on undamaged wool by treatment in an alkaline solution of diazotised sulphanilic acid. This would seem to suggest that the wool–diazo coupling reaction is of no use for damage detection. However, it was also observed that a simultaneous development of colour occurred in the test solution itself, when hydrolysis, followed by coupling, led to the formation of an azo compound, in accordance with the usual behaviour of diazo compounds during decomposition in aqueous solution.

This presented the possibility that, in either the presence or absence of any wool–diazo coupling, the substance colouring the solution is capable of colouring the wool under the usual conditions of treatment. Supporting evidence for this idea was sought, and since such behaviour would no doubt influence the quantitative reliability of the test, further investigation was carried out to examine the possibility of achieving complete wool–diazo coupling in a solution free from interfering azo compounds.

Experimental

PREPARATION OF WOOL

Root ends of staples from a sound 58s crossbred fleece were purified by 4 hr. extraction with ether in a Soxhlet apparatus, followed by several rinses in warm (30°C.) distilled water. The wool was then squeezed between filter papers, and conditioned at 65% R.H. and 21°C., and 0·1-g. samples were drawn after careful mixing.

Damage was effected by immersing 0·1-g. samples in 20 ml. of 0·1 N. (approx.) potassium hydroxide for 24 hr. at 21°C., and then washing in several changes of distilled water until free from alkali. The samples were again squeezed between filter papers and allowed to condition.

PREPARATION OF DIAZO COMPOUNDS

During the course of the investigation, three diazo compounds were examined, namely those from sulphanilic acid, *o*-nitroaniline, and 2-methoxy-5-nitroaniline. Diazotised sulphanilic acid was prepared by addition of 5 ml. of 8% sodium nitrite and 2 ml. of concentrated hydrochloric acid to 10 ml. of 10% sodium sulphanilate [2]. Diazotised *o*-nitroaniline and diazotised 2-methoxy-5-nitroaniline [4,5] were prepared as 0·25% solutions of the stable commercial salts, Brentamine Fast Orange GR Salt (ICI) and Brentamine Fast Scarlet R Salt (ICI) respectively.

Owing to the general instability of diazo compounds in aqueous solutions, these were all prepared, away from the possible effects of sunlight, immediately before use.

METHOD OF EXPERIMENT

Diazotised solutions of various pH values and at various temperatures were allowed to stand while

decomposition and colour development proceeded. The intensity of the colour was measured at intervals with a Spekker photoelectric absorptiometer (Hilger & Watts) using Ilford Spectrum filters.

Conditioned 0·1-g. wool samples were then treated for various times in identical solutions under the same conditions of pH and temperature. They were then washed thoroughly with distilled water and dissolved in 10 ml. of boiling 10% sodium hydroxide solution. After cooling and readjusting to 10 ml. with distilled water, the colour intensity of each solution was measured as before.

Results

The possible influence of azo formation in diazo solutions on the amount of colour developed on wool treated therein was suggested by the data illustrated in Fig. 1 and 2. In the former is shown

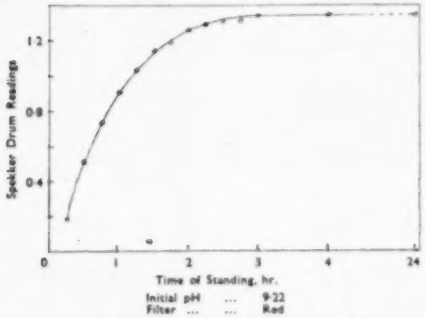

FIG. 1—Colour Formation in Diazotised Sulphanilic Acid Solution in the Dark at 21°C.

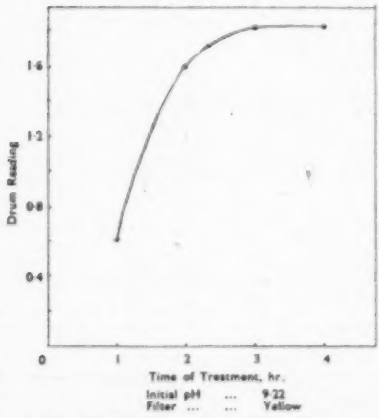

FIG. 2—Colour Formation on Undamaged Wool in Diazotised Sulphanilic Acid Solution in the Dark at 21°C.

the progressive increase in the intensity of colour in 17 ml. of diazotised sulphanilic acid to which had been added 15 ml. of 9% sodium carbonate [2], when allowed to stand in darkness at 21°c. Fig. 2 shows the amounts of colour developed on undamaged wool samples treated for various times in a similar solution.

In order to ascertain whether the azo compound formed by decomposition of the diazo compound could be taken up by the undamaged wool, solutions of azo compounds, free from diazotised sulphanilic acid, were prepared by allowing the diazo solutions to stand until a test with phenol yielded no bright red azo compound, thus indicating complete absence of diazo compounds. Samples of wool were immersed in such solutions for 4 hr. at room temperature, and also for 30 min. at the boil. In neither case was any staining of the wool apparent. These observations, together with the facts that undamaged wool does become coloured in diazo solutions and that maximum colour development, both on the wool and in solution, occurs after 3 hr., seem to indicate that decomposition and azo formation occur both inside and outside the fibre simultaneously. Thus staining is due to azo compound formation within the fibre rather than to adsorption from solution.

Further evidence to support this view is presented by the data illustrated in Fig. 3 and 4, in which the

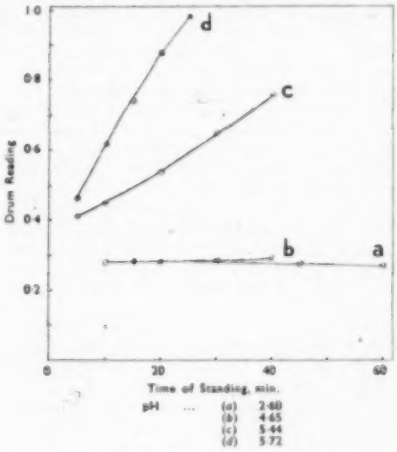

FIG. 3—Effect of pH on Colour Formation in Diazotised Sulphanilic Acid in the Dark at 21°C.

effect of pH on the development of colour in solution and on damaged wool is examined. Equal volumes of the diazotised sulphanilic acid solution were taken and, after addition of different volumes of 9% sodium carbonate, allowed to stand, at 21°c., in darkness. Periodic measurements of colour intensity were made. Fig. 3 shows that an increase in pH produces an increase in the rate of colour development in the solution. From Fig. 4 it can be seen that a similar result is obtained on treatment of damaged wool samples in identical solutions and under the same conditions.

It will be seen from Fig. 3 that, at pH 4·65 and lower values, no appreciable amount of colour development has occurred in the solutions during

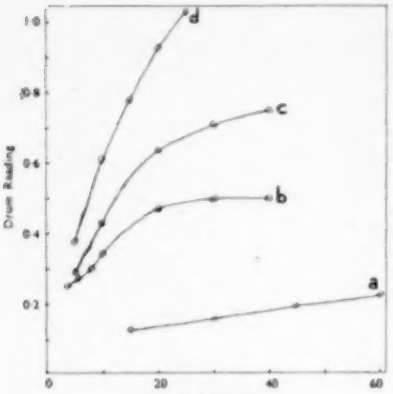

FIG. 4—Effect of pH on Colour Formation on Damaged Wool in Diazotised Sulphanilic Acid in the Dark at 21°C.

the time of examination. The most significant feature of the results, however, is that the colour developed on damaged wool samples treated at pH 4·65 reaches a maximum (Fig. 4) during the time in which there is no appreciable development of colour in the solution itself (Fig. 3).

Similar results were obtained with the other two diazo solutions, which were used in the form of 50-ml. aliquots of the Brentamine Fast Salts, the different pH values being obtained by dissolving the salts in distilled water or in sodium acetate solutions of various concentrations. All tests were carried out in darkness, at 21°C., the results being illustrated by Fig. 5–8.

With solutions in which there was no significant amount of secondary azo compound (curves (*a*)), the wool colour intensity increased until a maximum value was obtained, after which no further

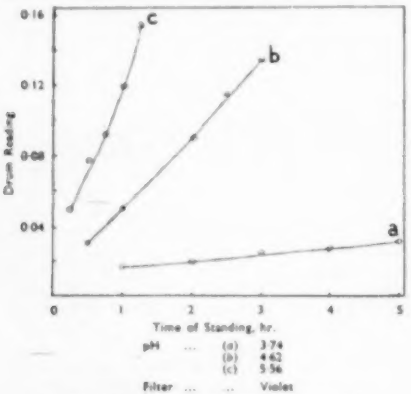

FIG. 5—Colour Formation in Diazotised o-Nitroaniline

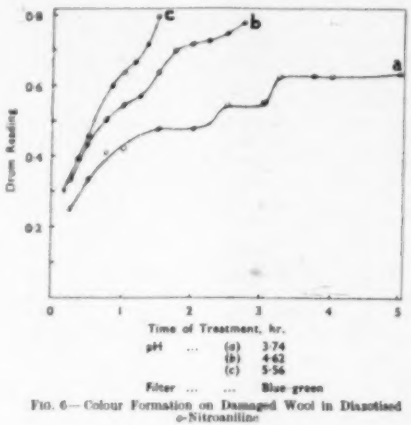

FIG. 6—Colour Formation on Damaged Wool in Diazotised o-Nitroaniline

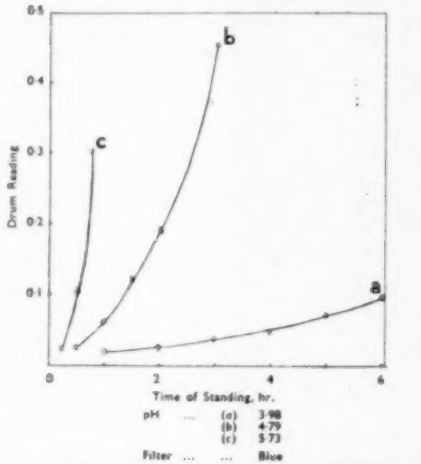

FIG. 7—Colour Formation in Diazotised 2-Methoxy-5-nitroaniline

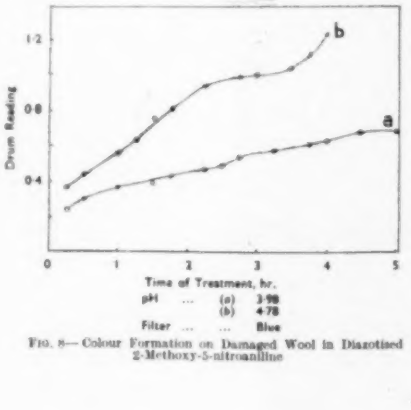

FIG. 8—Colour Formation on Damaged Wool in Diazotised 2-Methoxy-5-nitroaniline

colour development occurred. It seems reasonable to assume that this maximum probably represents the colour developed as a result of complete wool–diazo coupling for the particular degree of damage involved. However, with solutions of higher pH secondary reaction does occur, the colour of the wool being seen to reach a greater intensity than the maximum obtained in the above case. This could be explained by the formation of colour from the secondary reaction over and above that due to the complete wool–diazo coupling.

The stability of aqueous diazo solutions is known to be affected by light and temperature, and it was therefore decided to investigate the effects of these factors on the wool–diazo reaction. Examination was restricted, in each case, to the solution in which the development of colour on damaged wool reached a maximum while free from interference by secondary azo compounds, when treated in darkness at 21°c.

In the case of the diazotised sulphanilic acid, however, difficulty was found in reproducing the required pH 4·65, probably because the solution was not buffered. This was overcome by using 40 ml. of 5% sodium acetate solution instead of the sodium carbonate in the preparation of the solution. Treatment of damaged wool samples in this new solution, in darkness at 21°c., gave results similar to those obtained with the Brentamine Fast Salts.

In order to study the effect of light, duplicate solutions of each diazo compound were prepared in darkness, and allowed to stand for an extended period at 16°c., one remaining in darkness and the other being exposed to sunlight. Periodic measurement of the colour intensity of each solution was made. Table I shows that diazotised sulphanilic acid is relatively insensitive to the effect of sunlight, while the diazotised *o*-nitroaniline and 2-methoxy-5-nitroaniline solutions are particularly sensitive.

TABLE I

Development of Colour in Diazo Solutions in Sunlight and in the Dark

(Spekker drum readings)

Diazotised base ...	Sulphanilic Acid		*o*-Nitroaniline		2-Methoxy-5-nitroaniline	
Initial pH ...	4·65		3·74		3·98	
Filter ...	Violet		Violet		Blue	
Time (hr.)	Dark	Light	Dark	Light	Dark	Light
1 ...	0·066	0·120	0·021	0·160	0·014	0·180
2 ...	0·070	0·132	0·021	0·595	0·019	0·850
3 ...	0·083	0·155	0·023	—	0·025	—
4 ...	0·095	0·175	0·025	—	0·032	—

Solutions were then prepared and allowed to stand, in darkness at different temperatures, for a period necessary to produce, in each case, maximum wool colour development at 21°c. In Table II are shown the results obtained for the amount of colour developed in solution and on damaged wool.

It will be seen that diazotised *o*-nitroaniline is stable between 16° and 21°c., giving the same result (0·63) as the constant maximum shown in Fig. 6 (*a*), whereas the other two compounds are particularly sensitive to temperature changes.

TABLE II

Development of Colour in Diazo Solutions and on Wool

(Spekker drum readings)

Diazotised base ...	Sulphanilic Acid		*o*-Nitroaniline		2-Methoxy-5-nitroaniline	
Initial pH (21°c.) ...	4·65		3·74		3·98	
Time of treatment, hr.	4		4		5	
Filter ...	Violet	Yellow	Violet	Blue–green	Blue	Blue
Temp. (°c.)	Soln.	Wool	Soln.	Wool	Soln.	Wool
16 ...	0·095	0·405	0·025	0·630	0·044	0·590
21 ...	0·220	0·545	0·027	0·630	0·072	0·690
36 ...	—	0·830	0·047	0·850	—	1·430

Discussion

The Pauly test depends on the formation of coloured compounds in wool as a result of a coupling reaction between a diazo compound and certain of the amino acids present in wool, the degree of colouring being used as a qualitative measure of the extent of damage to the wool. However, the experimental results given seem to indicate that the azo compounds which usually form in aqueous diazo solutions, owing to decomposition to a phenol followed by coupling with excess diazo compound, can also form in wool immersed in the solution, thus colouring it.

In the event of such behaviour, measurement of the intensity of colour developed on treated wool would lead to a false evaluation of the degree of damage. Similarly, determination of the amount of diazo compound present in the solution before and after treatment would give a high result unless carried out in darkness at approx. 0°c., as a considerable amount of the diazo compound would be lost in the formation of the secondary azo compound, both in the solution and on the wool.

By selection of suitable convenient conditions, however, it is possible to lower the rate of secondary azo formation to such an extent that even after some hours there is no significant development of colour in the solution. During this time, the amount of colour developed on treated wool reaches a maximum, and while this may or may not represent the amount of colour developed by complete wool–diazo coupling, it is certainly due only to wool–diazo coupling, representing some definite stage in the reaction. Irrespective of the completeness or otherwise of the coupling reaction, it is suggested that this stage in the reaction, which corresponds to a definite and reproducible maximum value for colour development, could be used as a standard for the comparison and quantitative estimation of wool damage or, more correctly, wool modification. From the above results, the most satisfactory diazo compound, of those examined, is diazotised *o*-nitroaniline.

In accordance with these ideas, the following details are suggested as being satisfactory for comparison and quantitative assessment of wool modification — 0·1 g. of conditioned wool is immersed in 50 ml. of 0·25% Brentamine Fast

Orange GR Salt (ICI) solution, allowed to stand in darkness for 4 hr. at normal temperature, and then removed and washed thoroughly. The wool is then dissolved in 10 ml. of boiling 10% sodium hydroxide solution, cooled, and made up to 10 ml. with distilled water. The colour intensity of the resultant solution is measured.

Certain precautions must be observed in order to obtain reproducible results. Firstly, if the solution of wool in sodium hydroxide shows any degree of turbidity, then measurement with the Spekker photoelectric absorptiometer will lead to a false result. Secondly, although there is no significant amount of colour developed in the solution during the specified 4 hr. of treatment, unreasonable extension of this time will also lead to false results, as it is almost certain that the solution colour development, however slow, will eventually reach significant proportions, and thus interfere with the reliability of the test.

Appendix

Following on from the development of this modified Pauly test, a preliminary examination was carried out to ascertain its usefulness for the quantitative assessment of various types of chemical damage of wool. This work is incomplete, but the trend of the results may be of interest to other workers and is therefore included in this note.

Wool from the same fleece and purified in the same manner as before was used in this work.

Attention was first given to the effect of aqueous solutions of different pH values, the damage, as assessed by the modified Pauly test, being compared with the changes in the work required to stretch single fibres and in the cystine content of the wool. Treatments were carried out at 21°c. for 24 hr. and also at the boil for 15 min. In both cases the test gave no indication of damage when using acid media, but on the alkaline side there was reasonable correlation between the results for damage, reduction in work of stretching, and cystine breakdown.

The effect of treatment with boiling water for various times was then studied, again comparing the damage with changes in work of stretching and in cystine content. Reasonable correlation was observed when the damage results were compared with the loss in cystine, although when treatment was carried on longer than 90 min., the results from the damage test increased at a greater rate than the fall in cystine content. The figures obtained for the reduction in work of stretching single fibres were rather erratic but showed a rough correlation. It is felt that simultaneous linkage breakdown and rebuilding reactions prevent any accurate conclusions from being drawn.

When wool treated with an alcoholic solution of potassium hydroxide under conditions used for producing shrink-resistant effects was subjected to the same tests as in the previous cases, an appreciable damage figure was obtained without any significant change in the other two characteristics. Since reaction is mainly confined to the surface of the fibre, the changes which give rise to the positive damage test are apparently too small to be detected by the other methods.

Summarising this preliminary work, it would appear that, with certain types of damage, it may be possible to get quantitative correlation between the modified Pauly test and other physical or chemical changes, but that, in general, the interpretation of the overall effect of any treatment is beyond the scope of the test.

* * *

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CORRESPONDENCE

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Shrink-resisting of Men's Half-hose

The Editor

SIR,

The results given by Stewart [1] for the effect of alcoholic alkali on the felting shrinkage and wearing properties of wool do not agree with those of previous workers [2–4]. According to Stewart, 2 min. treatment with 1% alcoholic alkali eliminated felting shrinkage of socks but damaged the wool owing to overtreatment. In the original work on this method of shrink-proofing [2,3], 6% alcoholic alkali was used for 2 min. without overtreatment, whilst with a 1% solution 25 min. treatment was needed to produce satisfactory results, again with no sign of overtreatment.

In view of these differences, we have treated 5-in. squares of a 64s-quality plain-weave woollen fabric in the solutions described by Stewart for different times at 25°c. Shrinkage was then ascertained by machine-washing the treated samples with untreated controls for 40 min. in 0·05% soap solution at 40°c. The results are given above, each figure representing the mean of three different treatments.

Time of Treatment (min.)	Area Shrinkage (%)
Control	39
2	39
25	18

It can be seen that 2 min. treatment has not caused any observable alteration in the felting properties of the wool. In addition, the changes in colour and handle reported by Stewart did not occur. Perhaps the temperature used by Stewart, which is not stated, may have been too high; the temperature should not exceed 30°c. for satisfactory results [4].

Yours faithfully

M. LIPSON
C. H. NICHOLLS

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
WOOL TEXTILE RESEARCH LABORATORY
GEELONG
AUSTRALIA

25th July 1951

[1] Stewart, J.S.D.C., **67**, 138 (April 1951).
[2] Freney and Lipson, *Counc. Sci. Ind. Res., Australia, Pamphlet* 94 (1940).
[3] Idem, *J. Counc. Sci. Ind. Res. Australia*, **14**, 25 (1941).
[4] Lipson and Clyne, *Counc. Sci. Ind. Res. Australia, Pamphlet* 115 (1941).
[5] Clapham, *Amer. Dyestuff Rep.*, **34**, P 68 (1945).
[6] Lipson, *J. Textile Inst.*, **38**, P 279 (1947).

Notes

Notice to Authors

In view of the high costs of paper and printing, the co-operation of authors is sought in carrying out the suggestions contained in the notice on pp. 1–2 for keeping their papers concise. In this way it is hoped to continue to publish all papers of a suitable character submitted to the *Journal*.

Change of Address

As from Monday, 11th February 1952, the Society's general offices will be moved to Dean House, 19 Piccadilly, Bradford, Yorkshire, to which address all communications should be sent as from that date. The telephone number, Bradford 25138, will remain unchanged.

Extraordinary General Meeting

An Extraordinary General Meeting of the Society of Dyers and Colourists was held at the Great Northern Victoria Hotel, Bradford, Yorkshire, on Thursday, 1st November 1951, at 7.0 p.m., the President (Mr. F. SCHOLEFIELD) being in the chair and sixty other Members of the Society being present.

The Honorary Secretary (Mr. J. BARRITT) read from the notice convening the meeting the purpose for which it had been called—

To consider, and if thought fit approve, the following amendment to the Bye-laws, proposed by the Council—

In Bye-law 40, the alteration of the first paragraph to read—

The annual subscription to the Society shall be £3 3s 0d for Ordinary Members and 15s 0d for Junior Members, or such other sums as shall be determined by a General Meeting.

The Honorary Treasurer (Mr. H. JENNISON), in formally moving the adoption of the proposed amendment to Bye-law 40, compared the main items of income and expenditure for 1950 with the corresponding figures for 1938, the last normal pre-war year. The percentage increases between these two years showed the great increase in the scale of the Society's activities. Mr. Jennison stressed that the great increase in the cost of printing and publishing the *Journal* made the proposed change in membership subscription unavoidable if the present high standard of the *Journal* were to be maintained. Moreover, the Society would, in the future, have to meet increased charges in connection with its General Offices.

Mr. G. M. WILLIAMS, in seconding the motion, said that several years ago the Manchester Section Committee had passed a resolution expressing its approval of any proposed increase in membership subscription. This had been endorsed by the Committee two weeks earlier.

The Honorary Secretary said that only one letter of criticism from a Member had been received. This made the three points that— (*a*) the proposed increase was unnecessary in view of the surplus shown by the accounts for 1950; (*b*) every effort should be made to attract new Members to the

Society; and (*c*) Council had acted undemocratically, and every Member of the Society should have an opportunity of expressing his opinion on the matter, by means of a postal ballot or otherwise. Commenting on these criticisms, Mr. Barritt said that— (*a*) the surplus for 1951 would be much less than that for 1950, and the new increases in costs would convert this surplus into a deficit if no other measures were taken; (*b*) every effort was made by Council to secure new Members; and (*c*) Council had to abide by the Bye-laws of the Society, which laid down that an amendment to the Bye-laws could be passed only at a General Meeting of the Society; the Members of the Council were elected by postal ballot, and were in close touch with Members' views.

Mr. BARRITT stated that he had received letters pledging support for the amendment from the London, Manchester, Midlands, Northern Ireland, and Scottish Sections, and from individual members.

In declaring the motion open for discussion, the President said that the Council had felt itself compelled to put forward the proposed amendment, but did so with reluctance.

Mr. A. E. BOOTHROYD suggested that the rate for Ordinary Members should be increased to 3½ guineas and that for Junior Members should be only 7s 6d.

Mr. BARRITT stated that he had received two letters suggesting that the proposed subscription for Junior Members was still too low, and he felt that a membership fee of 7s 6d was unrealistic.

Mr. J. L. FRIEND said that members of the Bradford Junior Branch, of which he was Honorary Secretary, did not feel the proposed increase in subscription for Junior Members to be unreasonable, but he felt that the proposed change for Ordinary Members would entail hardship for student members over 21 years of age. Resignations on this account would probably number twenty, and the difficulties of recruitment would be increased.

Mr. BARRITT drew attention to the power of Council to consider individual cases of hardship vested in it by the last paragraph of Bye-law 40—

> Notwithstanding the foregoing provisions of this Bye-law the Council shall have power to remit or reduce the sum payable by any person, or to defer the time of payment, as they shall think fit.

and said that many reductions in the membership fee had been made for students and members serving in the armed forces. He had the authority of the President and Council to say that sympathetic consideration would be given to any cases of real hardship.

Mr. G. G. HOPKINSON pointed out that the proposed increased subscription worked out at only 2d per day.

Mr. H. FOSTER suggested that the intermediate grade of Associate Membership, e.g. at £2 2s 0d per annum, might be reintroduced for members between the ages of 21 and 25 years.

Mr. G. G. BRADSHAW said that it was not necessarily a matter for congratulation that the subscription had not been increased earlier, and he felt that it should have been done long ago.

The President then put the motion to the vote, and it was carried with four dissentient votes.

The President concluded the meeting by thanking members for their support of the Council.

Proceedings of the Council

At meetings of the Council, held at the offices of the Society, 32–34 Piccadilly, Bradford, on 12th September, 17th October, and 14th November 1951, the proceedings included the following items of interest—

MEMBERSHIP SUBSCRIPTION— It was resolved to request the President to convene an Extraordinary General Meeting of the Society to consider an amendment to Bye-law 40 increasing the annual subscription for Ordinary Members from £2 2s 0d to £3 3s 0d and that for Junior Members from 10s 6d to 15s 0d (see above).

SOCIETY'S OFFICES— It was reported that the existing lease of the offices of the Society at 32–34 Piccadilly would terminate on 31st December 1951 and that the landlord was unwilling to renew it. Arrangements had been made to lease a suite of offices in Dean House, 19 Piccadilly, and the removal would be made early in the new year.

TINCTORIAL ARTS TO-DAY CONFERENCE— A report on the Conference was accepted, and it was resolved that the thanks of Council be conveyed to all those responsible for the arrangements. The report stated that 300 copies of the preprints were sold, and that the attendance was 150–200 at the meetings and over 330 at the Conference Dinner.

DYERS COMPANY MEDAL— The report of the adjudication committee, recommending the award of the research medal for 1950–51 to J. Crank, M.Sc., F.Inst.P., was accepted (see p. 5).

BRITISH NATIONAL COMMITTEE FOR CHEMISTRY— Mr. J. Barritt was invited to continue to represent the Society on this body.

LEEDS JUNIOR BRANCH— The election at the Annual General Meeting of the Branch of the following officers and committee members for the 1951–52 session was reported—

Chairman	C. B. Stevens
Vice-chairman	C. L. Bird
Honorary Secretary ...	J. Waller
Committee	A. R. R. Priest, A. T. Peters, Pamela Harris, and J. D. Sanders

BRADFORD JUNIOR BRANCH— It was reported that Mr. D. B. Williamson had replaced Mr. O'Brien as Chairman.

SOCIETY'S MEDAL— The recommendation of the Medals Committee that the Gold Medal be awarded to W. Kilby, B.Sc.Tech., was approved unanimously (see p. 4).

NEDERLANDSCHE VEREENIGING VOOR TEXTIEL-CHEMIE— It was resolved that the Society's greetings and desire for closer co-operation be expressed in reply to a letter from the Dutch association requesting closer relations and the exchange of visits with the Society.

ACCOUNTS— The balance sheet and accounts for the nine months ending 30th September 1951 were approved.

BYE-LAWS OF THE NORTHERN IRELAND SECTION — Approval was given to an amendment of Bye-law 7 of the Northern Ireland Section, reducing the interval for the receipt of nominations from 28 to 14 days before the date of the Annual General Meeting.

MEMBERSHIP— Thirty-five applications for Ordinary Membership and four for Junior Membership were approved.

Deaths

We regret to report the loss by death of Dr. H. E. Cox, Mr. Samuel Heap, Mr. L. Stanley, and Mr. Edgar Thornton.

Meetings of Council and Committees

November 1951

Council— 14th
Finance— 14th
Publications— 20th
Colour Index Editorial Panel— 5th
Fastness Tests Co-ordinating— 27th
Society's Medals —1st

December 1951

Council— 12th
Finance— 12th
Publications— 18th
Colour Index Editorial Panel— 3rd
Terms and Definitions— 5th

Fifty Years' Membership

The following Members — Messrs. Ellis Clayton, Louis Emerson, J. R. Hannay, H. W. Martin, and R. J. Steele— joined the Society before the end of 1901, and have thus completed fifty years of membership. The Council wishes to congratulate them on this notable achievement, and trusts that they may long be spared to continue their interest in the Society's activities.

Subscription Rates to the *Journal*

Owing to the increase in the cost of publishing the *Journal*, it has unfortunately been found necessary to increase the subscription rate for non-members to £4 per annum, and the charge for the abstracts section printed on one side of the paper to 30s. 0d. The new charges for reprints of papers will be found on p. I.

Abstracts Section

Beginning with this issue, certain modifications of lay-out have been introduced in the Abstracts Section of the *Journal*. The most notable is that titles of papers from periodicals, as well as those of patents, will now be modified where necessary to indicate the subject of the abstract. The abbreviations listed below will be employed throughout, and cross-references are now printed in roman type, not in bold type as hitherto. Names of individuals will be omitted in the cases of patents taken out by firms, and such abbreviations as Inc., Ltd., and Pty. also will be omitted.

Abbreviations of Names of Firms, etc.

The abbreviations listed below will in future be employed in the *Journal*. The shortened names of firms will be used in abstracts of patent specifications, while those abbreviations in the form of initials will be used also after the commercial names of dyes.

AAP	American Aniline Products Inc.
AATCC ...	American Association of Textile Chemists and Colorists
Basf	Badische Anilin- & Soda-Fabrik
Br	Brotherton & Co. Ltd.
BrC	British Celanese Ltd.
CAC	Clayton Aniline Co. Ltd.
CCC	American Cyanamid Co., Calco Chemical Division
CFM	Cassella Farbwerke Mainkur
Ciba	Ciba Ltd.
DH	Durand & Huguenin S.A.
DuP	E. I. du Pont de Nemours & Co. Inc.
FBy	Farbenfabriken Bayer
FH	Farbwerke Hoechst
Fran	Société Anonyme de Matières Colorantes et Produits Chimiques Francolor Compagnie Française des Matières Colorantes
G	General Dyestuff Corpn.
General Aniline	General Aniline & Film Corpn.
Gevaert ...	Gevaert Photo-Producten N.V.
Gy	J. R. Geigy A.-G.
IC	Interchemical Corpn.
ICI	Imperial Chemical Industries Ltd.
JR	James Robinson & Co. Ltd.
LBH	L. B. Holliday & Co. Ltd.
Monsanto ...	Monsanto Chemical Co.
NAC	Allied Chemical & Dye Corpn., National Aniline Division
NCO	Naphtol-Chemie Offenbach
Rhône-Poulenc	Société des Usines Chimiques Rhône-Poulenc
S	Sandoz Ltd.
TE	Tennessee Eastman Corpn.
W	Williams (Hounslow) Ltd.
YDC	Yorkshire Dyeware & Chemical Co. Ltd.

Sodium Hydrosulphite—Dangerous Substance

In giving judgment in a case at Clerkenwell (London) Magistrates Court, the magistrate stated that in his view sodium hydrosulphite was a dangerous substance. It had been alleged that cartons containing this substance had ignited in course of transit by post and had caused damage to other mail. Witnesses stated that parcels of this material had been found on fire, which water had only served to aggravate. A chemist in the Engineering Department of the General Post Office said that sodium hydrosulphite was liable to catch fire spontaneously under the action of moisture in certain circumstances, but he agreed under cross-examination that it was extremely rare for this substance to catch fire. The defendants, a firm of wholesale chemists, said that they generally sent out the hydrosulphite in tins, not because they thought it was dangerous, but because it was liable to deteriorate if not kept dry; during the war it had been frequently sent out in cardboard containers. A lecturer on dyeing and cleaning stated in evidence that he had not seen an article in the *Journal* referring to a previous occasion when the substance had ignited; it was an extremely rare occurrence.

The exothermic oxidation of moist hydrosulphites has been mentioned in review articles [1, 2], while according to Gaertner [3] sufficient heat to

produce spontaneous ignition is evolved in presence of about 10% moisture. In 1948 it was stated [4] that—

> . . . Under specially favourable conditions sodium hydrosulphite can decompose exothermally with the liberation of about 10,350 calories per gram-molecule of the substance, when the colour changes through yellow to brown with the formation of free sulphur, which finally may ignite spontaneously and burn with a small bluish flame. In the event of such an extremely rare occurrence, the flame is readily extinguished by the addition of sand or dry earth, or by flooding with a large quantity of water. The addition of a small quantity of water accelerates the reaction.

[1] Chappell, N., J.S.D.C., **37**, 206 (1921).
[2] Appleton, H. B., *Dyer*, **91**, 137, 179, 191 (1944).
[3] Gaertner, K., *Chemiker-Zeitung*, **63**, 237 (1939).
[4] Brearley, G., and Starkie, J., J.S.D.C., **64**, 279 (1948).

New Books and Publications

Numerical Index to the Bibliography of Scientific and Industrial Reports Volumes 1-10, 1946-1948

Edited by the Science–Technology Group, Special Libraries Assocn. Pp. viii + 522*. New York 1949.

This is a numerical index to the ten volumes of the bibliography, each volume containing 1200 pp. and consisting of abstracts of the various scientific and industrial reports published by the U.S. Publications Board during 1946–1948.

Of this index, pp. 1–402 are occupied by a numerical index of PB 1–52,786 giving the volume and page number where they appear in the bibliography. Pp. 403–456 contain a list of those German patents (*G.P.* 419,649–772,440, but the sequence is broken) given in the bibliography. A similar list of Japanese patents (131,610–146,358) occupies pp. 457 and 458. On pp. 459–464 there is a list of BIOS numbers with the corresponding PB numbers, and this is followed by similar lists of CIOS (pp. 465–470), FD (pp. 471–476), FIAT (pp. 477–482), MDDC (pp. 483–485), and OSRD (pp. 486–495) numbers. There is an index to 1018 microfilm reels of the German patent applications which were pending in the German Patent Office at the time it was occupied by the Allies. These take up pp. 497–517 and are divided into their respective classes, e.g. Class 22 contains dyes, etc. The last four pages (519–522) consist of a bibliography of the subject indexes, classified lists, and correlations available from the O.T.S. and available in London at T.I.D.U. C. O. C.

* Available for consultation at T.I.D.U. (D.S.I.R.), Cunard Building, 15 Regent Street, London S.W.1.

Die neuzeitlichen Textilveredlungs-Verfahren der Kunstfasern

2. Lieferung

By F. Weber and A. Martina. Pp. 125–284. Vienna: Springer-Verlag. 1951. Price, 39s. 6d.

The first part of this work surveyed the scientific, technical, and patent literature of the period 1939–1950 on the manufacture of the various natural and synthetic textile fibres [1]. Part 2 contains a comprehensive review of the published literature covering the same period on the bleaching (Section 2) and the dyeing (Section 3) of these fibres.

Section 2 is divided into seven subsections, dealing respectively with — hypochlorite and chlorite bleaching, combination (i.e. hypochlorite–peroxide) bleaching, bleaching with peroxides, various bleaching processes and bleaching agents, bleaching with organic per-compounds, mixtures of surface-active compounds and per-salts as bleaching agents, and optical bleaching and brightening agents.

The section on dyeing is divided into five subsections— The first deals with the dyeing of the various textile fibres, each fibre receiving individual treatment. In the second the methods of applying the various classes of dyes, irrespective of the fibres, are considered. Subsection III is concerned with the alteration (enhancement) of the dyeing properties of the various fibres, such subjects as immunisation, the reserving of wool in admixture with other fibres, and the basifying of cellulose fibres to impart wool-dyeing properties also being discussed. In Subsection IV the aftertreatment of dyeings to improve their fastness properties is considered. In this connection the prevention of the gas-fading of acetate rayon dyeings receives special attention, though it would appear unfortunate that the authors refer to the fading of acetate dyeings by flue gases, etc. as "fading" and not, as is usual, as *gas fading*. In the short final subsection the weighting of silk is discussed, and also recent developments in weighting the rayons and the polyamide fibres.

In each section each subsection includes a summary of the important journal and patent literature; this is followed by a list of patents.

As the authors appear to have covered the journal literature only up to about the middle of 1950, it is clear that a number of important relevant contributions appearing in the various textile journals in the second half of 1950 are not mentioned in the text. Nevertheless, with this reservation, it may be said that the summaries at the beginning of each subsection are very complete, and indicate the care and thought which the authors have given to their compilation. So far as the reviewer could ascertain, the sections on bleaching and dyeing give an excellent coverage of the journal and patent literature during the period reviewed.

A few errors were detected in the text, but being obvious they are not serious. However, these are minor criticisms of a book which should be available to all persons engaged in the textile industry. The printing is of the high standard expected from the publishers, who, with the authors, are to be congratulated on the production of such an excellent publication.

J. H. MacGregor

[1] Part 1 reviewed in J.S.D.C., **67**, 152 (April 1951); Part 3, *ibid.*, **67**, 451 (Nov. 1951).

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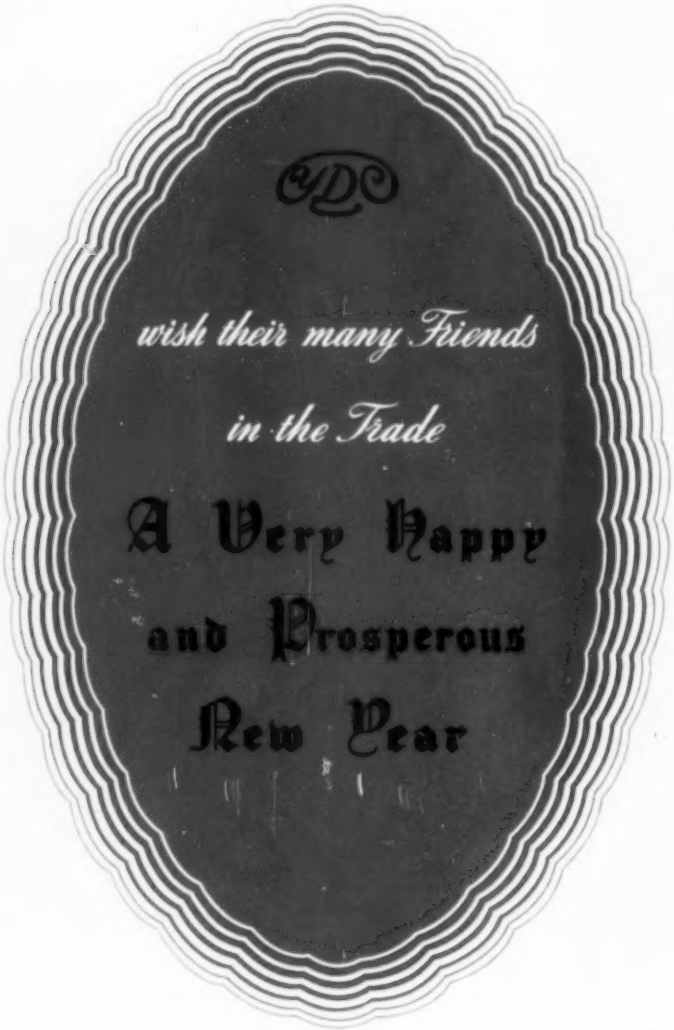

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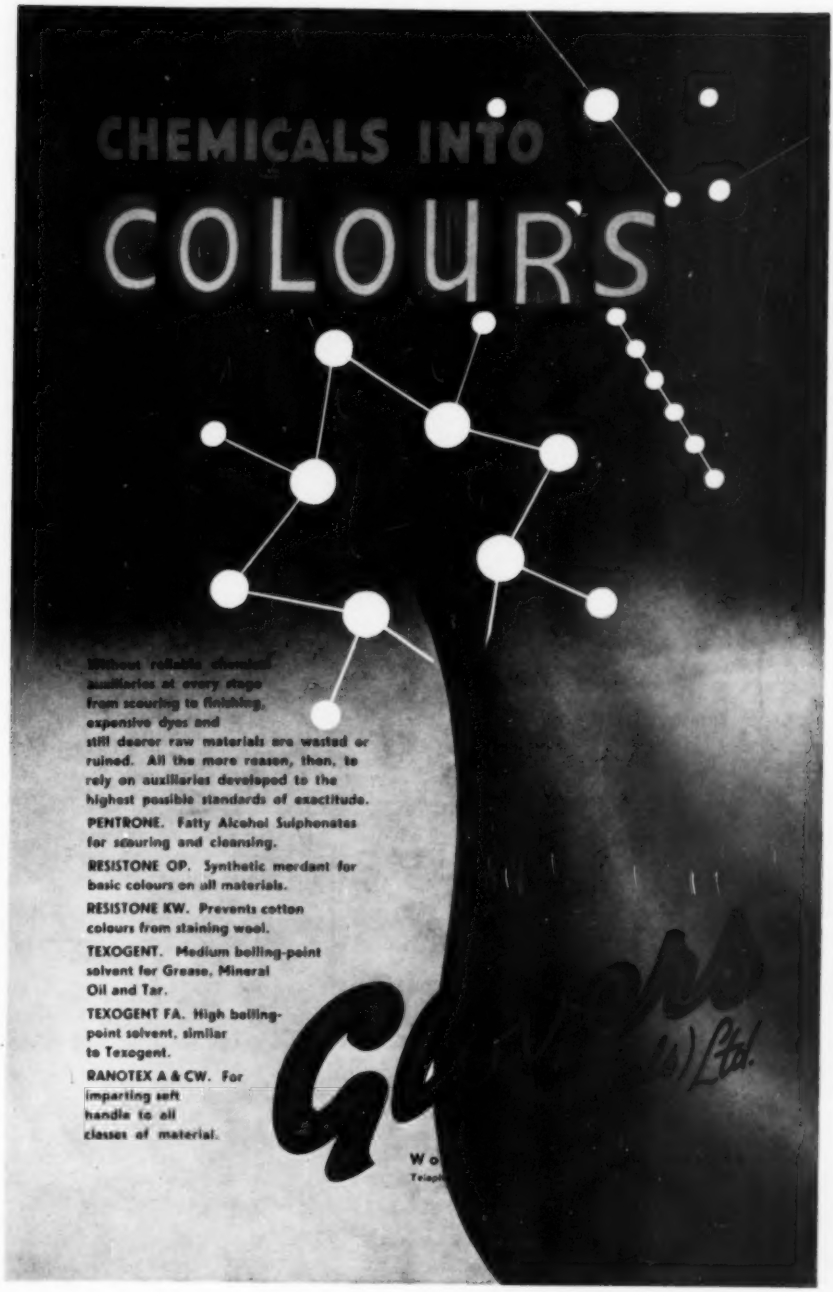
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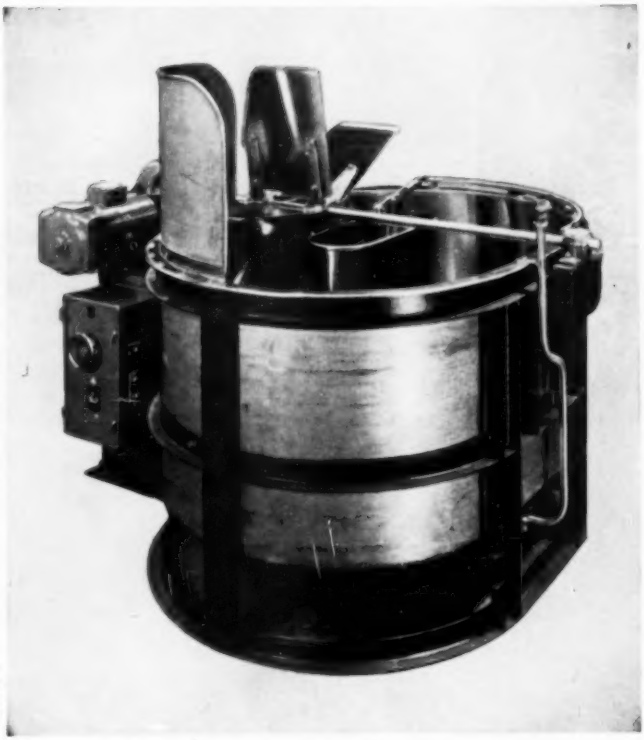

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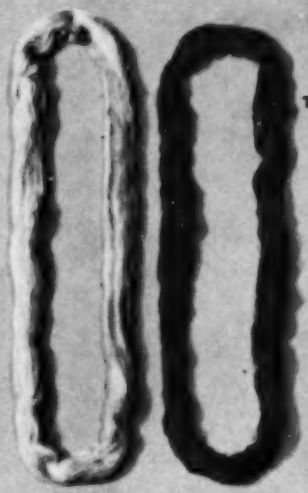

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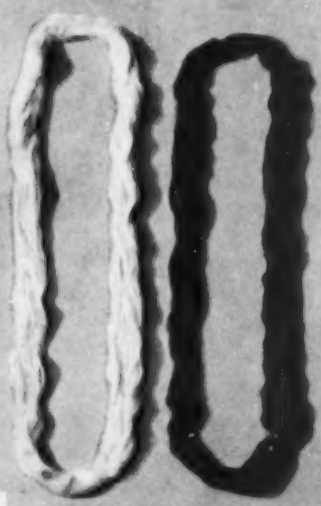

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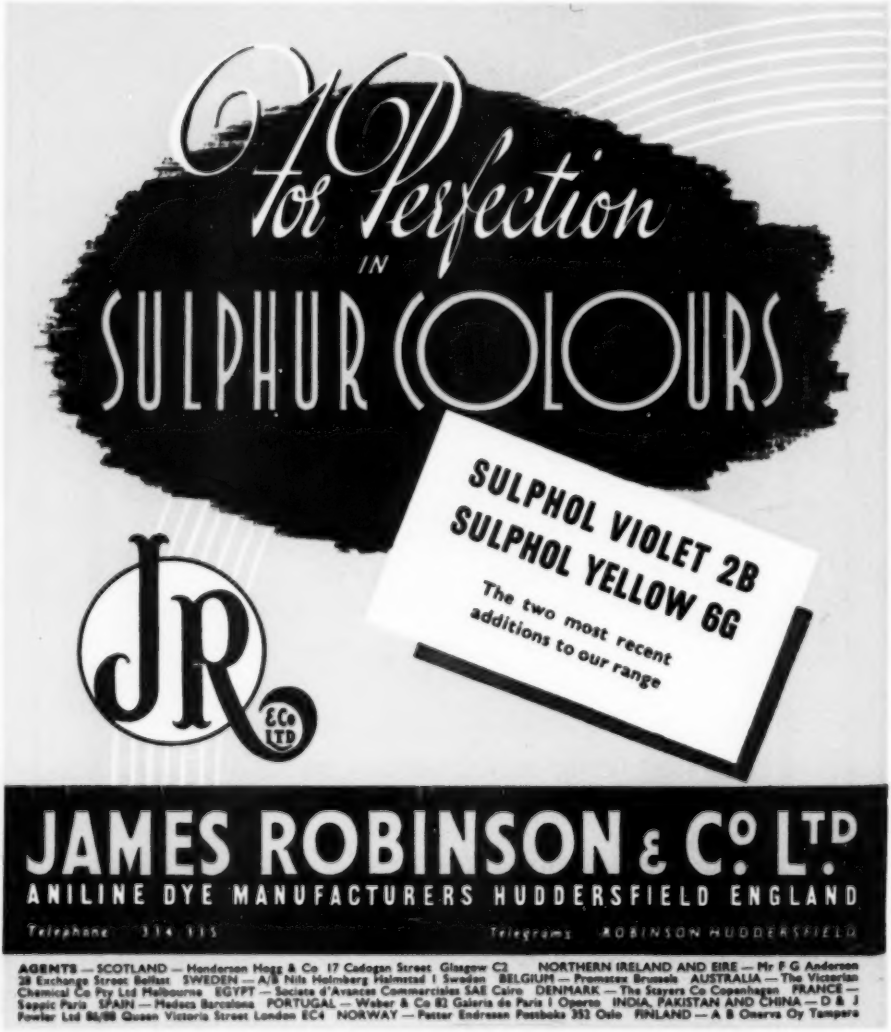

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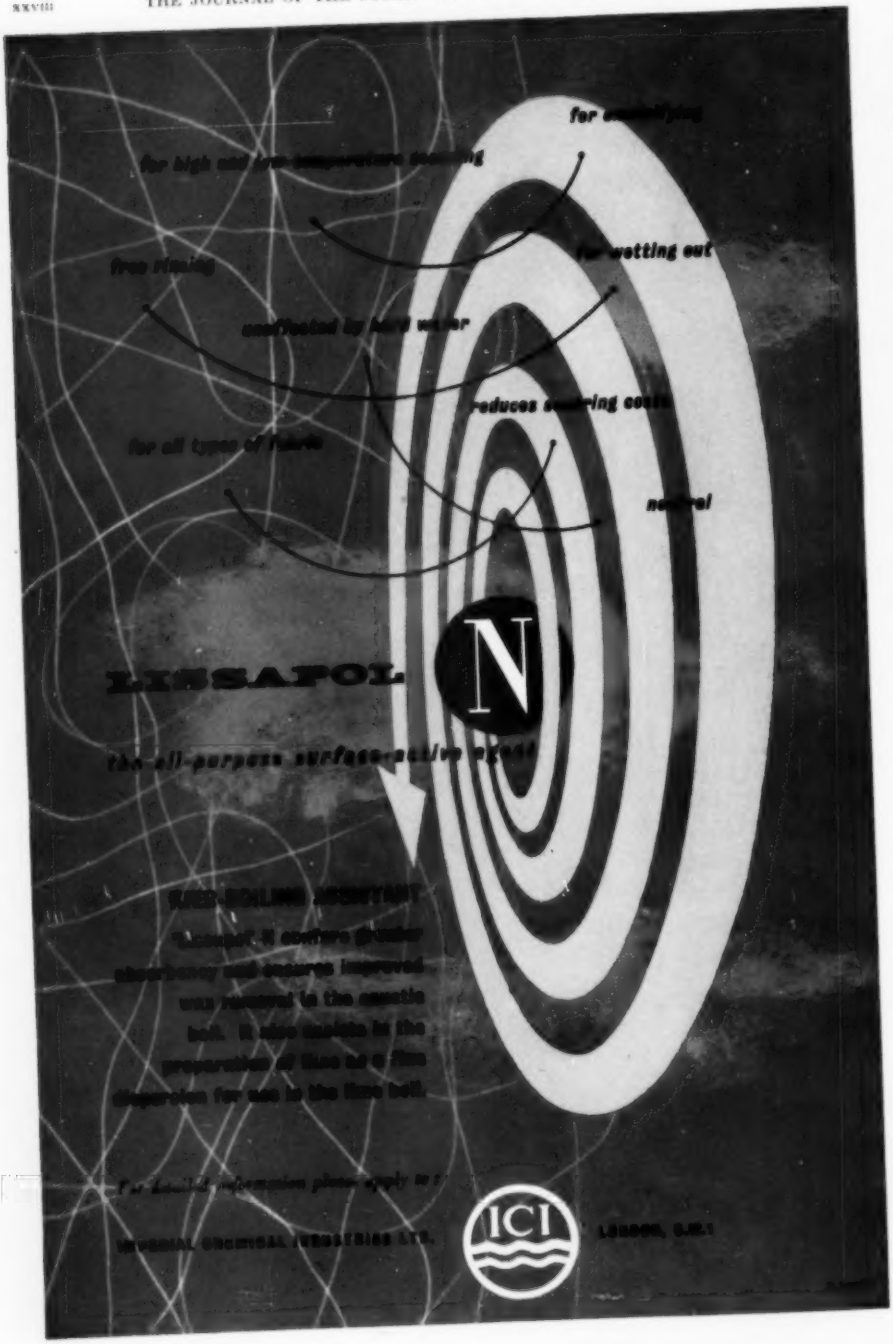
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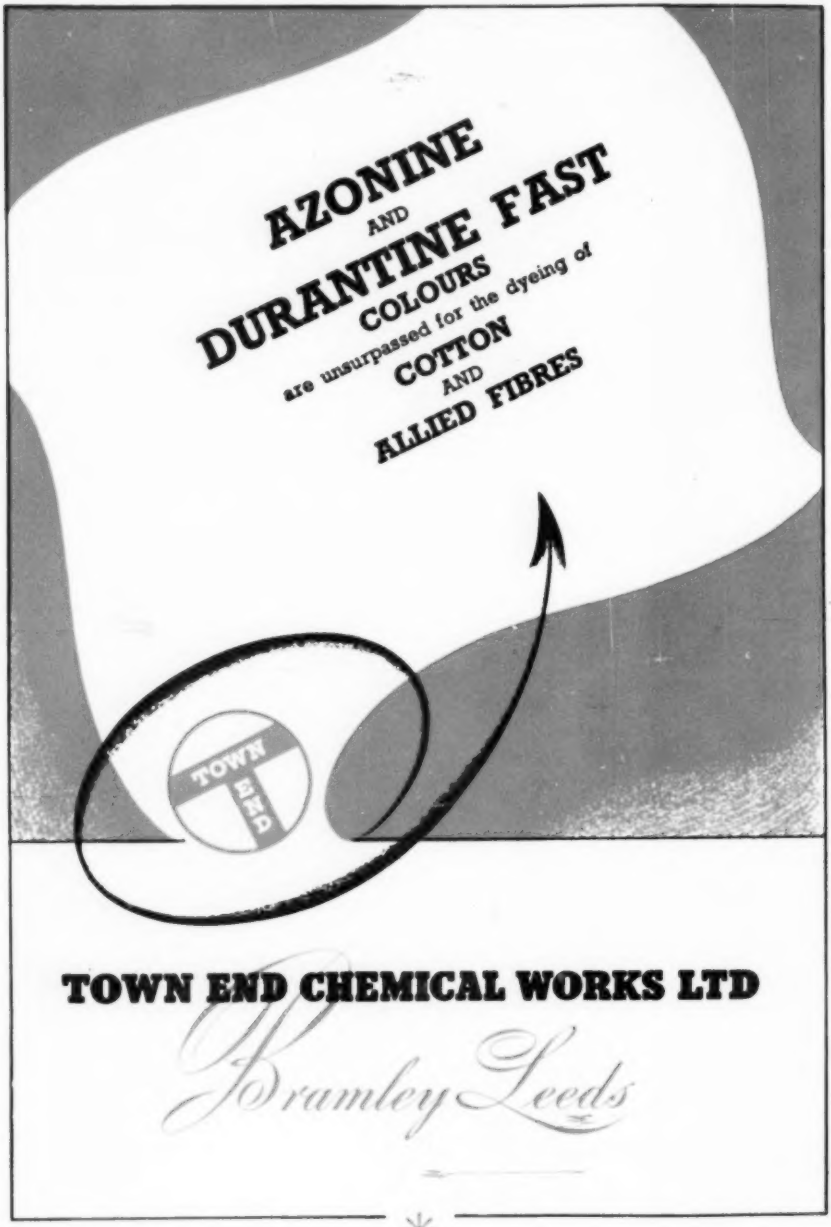
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Surface Chemistry

An Introduction to its Principles and Applications

By A. E. Alexander. Pp. vii + 70. London: Longmans, Green & Co. 1951. Price, 7s. 6d.

The aim of this book is to give a compact and elementary account of surface chemistry. Students normally meet the subject of surface chemistry at a late stage in their physicochemical education, and books on the subject are therefore commonly at an advanced level. In the present work the object has been to present an account of surface chemistry which can be understood by those with only a very elementary knowledge of physics and chemistry. The attempt has been strikingly successful. Naturally, the author has had to exercise a rigid restraint in the selection of material, yet a surprisingly extensive field has been covered.

The six chapters deal with the historical development of surface chemistry, insoluble monolayers and adsorbed films at liquid surfaces and interfaces, the gas–solid and liquid–solid interfaces, and electrical phenomena at interfaces. In this account a clear understanding is given of the fundamental properties of surfaces and the ways in which they differ from matter in bulk. A great deal of attention is paid to practical applications of surface chemistry, which are shown to be most diverse. The author brings out very clearly the important rôle of surface phenomena in many aspects of life and industry. Naturally, in only seventy pages, there is insufficient space to deal more than briefly with the numerous topics which are considered.

It seems to be a pity that, in a book which may be expected to foster interest and enthusiasm for surface chemistry, there are no suggestions for further reading. However, those who know nothing of surface chemistry will find here a fascinating introduction to the subject, and those whose knowledge of it may be somewhat out of date can read a balanced summary of recent work.

The book should be useful and popular. The production maintains the high standard which one expects from the publishers. A. F. H. Ward

Surface Activity

The Physical Chemistry, Technical Applications, and Chemical Constitution of Synthetic Surface-active Agents

By J. L. Moilliet and B. Collie. Pp. x + 379. London: E. & F. N. Spon Ltd. 1951. Price, 55s. 0d.

This important and long-awaited book fills a gap in the field of surface chemistry. Its subtitle describes accurately the ground covered, but the book is very much more than a technical guide to the use of surface-active materials. Part I, which extends to p. 145, gives a very thorough account of the fundamental physical chemistry of interfaces and provides useful reading for the "pure" physical chemist as well as for the chemist who is chiefly interested in industrial applications. The chapter headings, in this section, include surface-active agents, surface activity and interfacial processes, the states of solution of surface-active agents, the adsorption of surface-active agents at interfaces, and fundamental interfacial processes. Accounts are given of both classical and recent work, and the treatment is comprehensive and detailed. The authors have resisted the temptation to simplify difficult theoretical matter at the expense of accuracy, and the specialist will find here an authoritative guide to modern theories of surface chemistry. The authors have done more than summarise the work of others: they have not hesitated to give their own opinion of the value of such work and of the conclusions reached. From this section of the book, readers should be able to understand the principles which determine the choice of surface-active agents for particular applications.

In Part II, on technical applications, the subjects covered include— wetting-out and waterproofing, emulsification, dispersion of solids in liquids, detergent processes, and other miscellaneous applications. Here the fundamental theories are used in a study of the very diverse physicochemical phenomena involved, and it is seen how surface-active agents with particular properties are appropriate for the various applications. Many aspects of industrial practice are dealt with— textiles, mining, agriculture, pigments, etc.

The third part of the book is devoted to the chemical constitution of synthetic surface-active agents, classified according to their type— anionic agents, such as sulphonic acids and sulphonates, aliphatic sulphates, and similar types; cationic and non-ionic agents; and also other miscellaneous surface-active materials. Methods of preparation and of industrial manufacture are described, and the various materials are identified by both their chemical constitution and their trade names. The authors have deliberately refrained, however, from giving complete lists of commercial products, since such information is available elsewhere and would quickly become out of date.

References to the original literature are given conveniently at the foot of the page, and in addition there are an author index, an index of trade names, and a subject index. The last is quite detailed, and no difficulty should be found in using it for reference purposes. The book is clearly printed and well bound. The suggestion might be made that in a subsequent edition the initials of the authors of original literature should also be given in the references and the index.

This book may be confidently recommended as an authoritative and clear treatment of the subject. Much careful work has evidently gone into its compilation. It should be valuable not only to those who already use surface-active agents but also to those who may find suggestions for new uses.

A. F. H. Ward

Synthetic Methods of Organic Chemistry

Volume 5

By W. Theilheimer. Pp. xii + 612. Basle and New York: S. Karger (London: Interscience Publishers Ltd.). 1951. Price, 62.00 Swiss francs.

The present volume 5 continues the collection of organic synthetic methods over a period of one

year, and contains abstracts from papers published mostly in 1948 and 1949, with supplementary references from 1950. This book is the final volume of a first series, and consequently has been provided with an index to the entire series. As forecast in vol. IV, all the reaction titles of the preceding volumes are given in English in the body of the text, so that a threefold search in vol. III, IV, and V respectively is reduced to a single operation. Since vol. III and IV have been published in German only, although vol. I and II have English translations, this will be a great convenience to English-speaking readers. It is not intended to cumulate more than five volumes at a time, so that the reaction titles of this first series will be repeated in future volumes only when later references must be added. A table, indicating the sequence of the additional reagents used to subdivide the reactions listed under one reaction symbol, has been included in this volume for the first time, to enable location of reactions in the body of the text, particularly within large chapters. This table contains also such frequently used reagents as caustic soda and hydrochloric acid, which are not included in the subject index. A subdivision, not expressed by the reaction symbol, is made on the basis of the additional reagents characteristic of the reaction, and the order usually follows that of the periodic system. Reagents made up of several components are arranged according to the significant element for the reaction, e.g. potassium permanganate under "manganese", sodium hypochlorite under "chlorine", etc. When a constituent of the reagent goes into the products of the reaction, the remainder of the reagent, which acts as a carrier of this constituent, is the criterion for the classification; e.g. phosphorus is the carrier in a chlorination with phosphorus pentachloride, and sodium in a nitrosation with sodium nitrite. A table is included which indicates the sequence of the additional reagents used in this volume. When changes in more than one chemical bond occur during a reaction, e.g. in the formation of a new ring, or if the reaction can be carried out in different ways, these reactions are introduced in several places when necessary. The cumulative index of 92 pages lists the names of the methods, types of compounds, reagents, etc. For specific compounds and for authors (where a method is not named after them), it will usually be necessary for the reader to refer to the indexes of abstracts journals. There is also a short compilation of common German words and terms with their English equivalents, which will be useful for vol. III and IV. The book concludes with a comprehensive list of supplementary references to all five volumes of the series. Perhaps the real value of this particular set is the time it saves in providing direction to published information about any particular reaction, together with a serviceable outline of its nature. The book is exceedingly readable, like its four predecessors, and with 670 main titles, some with numerous subtitles, no organic research chemist can afford to be without access to it. H. H. HODGSON

La Décoration des Tissus
par un procédé manuel

By N. Pogranitsky. Pp. 92. Casablanca: Les Editions Amphora. 1950. Price, 250 francs.

This monograph is intended to assist artists and craftsmen who wish to apply their designs by hand to such articles as headsquares, scarves, table linen, and handkerchiefs, but whose knowledge of the behaviour and application of dyes is limited. The bulk of the book is taken up with information on the properties of various classes of colouring matters. Individual treatment is given to basic, acid and direct, mordant, oil- and wax-soluble, Indigosol, vat, and azoic and stabilised azoic dyes, but although the information will probably be adequate for those to whom the book is directed, only in the chapter on Indigosols does the author give much more than a paragraph on how to get the dyes into solution, followed by a list of the range manufactured by Messrs. Francolor.

The hand decorating techniques described are the "Serti" method, stencilling (through holes cut in a zinc plate), and direct brushwork using a concentrated solution of dye in water or alcohol. The Serti method consists in first tracing the outlines of the design in a water-resistant film, by squeezing a rubber solution (which may be coloured) on to the fabric from a tube. Any closed areas may then be coloured by the brush method.

Those portions of the book which deal with the steaming process, the preparation and properties of thickenings, and with the blow-out method of detecting heterogeneity in a dye powder are sketchy, and might soon prove to be inadequate for the enthusiastic exponent of these manual techniques. It is inferred from the chapter on colour mixing that the author's knowledge of colour physics is rudimentary. A. S. FERN

Abstracts from British and Foreign Journals and Patents

(The titles of abstracts may be modified. Abbreviations of names of firms are listed on p. 23; while other abbreviations and symbols, together with a list of the periodicals abstracted, will be found at the end of the annual index.)

I—PLANT; MACHINERY; BUILDINGS

Machinery for Finishing Woven Fabrics made of Synthetic Fibres. J. W. Tucker. *Amer. Dyestuff Rep.*, **40**, P 653–P 658 (1 Oct. 1951).

The finishing of woven fabrics from synthetic fibres is discussed from the machinery maker's viewpoint, mention being made of the treatment of the newer fibres nylon, Terylene, and Orlon. Included in the account are jigs, tenters, driers, curers, heat-setting machines, and calenders. J. W. B.

PATENTS

Homogeniser. A. Jensen. *BP* 658,920

Dyeing Loose Wool. J. M. Rugh. *USP* 2,548,740

The loose wool is placed in a vessel with a perforated false bottom, beneath which there is a sump. The vessel is provided with a lid which can be fastened down and rendered watertight and which has an outlet in it. There is an external expansion tank for the dye liquor, and the bottom of this tank is connected to the sump. From the sump a conduit passes through the centre of the vessel

and ends above a perforated plate, which is placed on the wool in the vessel. A pipe connects the outlet in the lid to the expansion tank. The liquor is circulated from the expansion chamber to the sump, where impellers drive it up the conduit, from the top of which some of the liquor is drawn back down through the wool and again driven up the conduit, while the remainder passes back through the outlet in the lid to the expansion chamber. The liquor is driven up through the conduit at a rate greater than that at which it can leave the vessel by the outlet in the lid. This gives excellent circulation of the liquor through the wool without creating such pressure in the upper part of the vessel as would unduly compress the wool, and so yields a lofty product. C. O. C.

Wet Processing of Loose Fibres. G. *USP* 2,552,078

The fibres are carried as a sheet between two endless perforated conveyors while being sprayed with and then passed through baths of the treating liquor or liquors. This allows rapid and uniform treatment of all the fibres and considerable savings in dyes and chemicals. C. O. C.

Thread-advancing Reel. Courtaulds. *BP* 659,270

A reel is described through which a heating fluid is circulated in such a manner as to ensure rapid and uniform heating of the bars. C. O. C.

Filament Storing and Advancing Device. H. A. Kuljian. *BP* 658,416

A filament-storing and -advancing device comprises a number of rotatable rollers situated round the periphery of a central drum. The holder of one set of roller ends may be adjusted to skew the rollers to permit any degree of thread advancement. An axial tube leads into each roller, and by way of a perforated circumference is used to introduce any desired aftertreating or rinsing agent to the thread, excess liquor being removed by a suction device operating through the outer surface of the central drum. J. W. B.

Treating Rayon Cakes and other Open Annular Packages of Yarn. Société de la Viscose Suisse. *BP* 657,530

The package is mounted on a perforated elastic jacket fastened to a holder. Process liquid is supplied to the jacket under pressure, being passed radially outwards and through the package. C. O. C.

Dyeing Rayon Cakes. N.V. Onderzoekingsinstituut Research. *BP* 660,907

Uniform dyeing is obtained with cakes produced with the aid of funnels with a serrated outlet by stacking the cakes in the machine without drying them and without deforming them in a direction at right-angles to their axis. C. O. C.

Wet Processing of Rayon Cakes, etc.. Oscar Koborn & Co. *USP* 2,553,106

A seal is placed at the end of a tubular cake, and a fluid-tight connection between the confronting faces of a pair of adjacent cakes placed end to end. Both seal and connection are responsive to the pressure of the processing liquor to effect hermetic sealing or fluid-tight coupling of the cakes. This allows free expansion and contraction of a stack of cakes.

USP 2,553,110

Distortion of the inner portion of a rayon cake due to sudden change of the liquid pressure or flow is prevented by placing a unilateral impedance to the flow of liquid so as to reduce the rapidity of efflux of the liquid from the interior of the cake when the pressure on the liquid is removed. C. O. C.

Wet Processing of Yarns. BrC. *BP* 660,513

The yarn is wound on to a flangeless perforated tube having at each end a circumferential channel to receive yarn windings, the yarn being wound on to the channels as well as the space between them. Such packages are then placed in a closed vessel, and the treating liquor is circulated through the perforations in the tube. C. O. C.

Wet Processing and Drying Textile Webs with Absence of Warp Tension. W. W. Spooner. *BP* 659,068

Streams of liquid or gas are directed at high velocity on to one or both sides simultaneously of the web from nozzles placed singly or in groups on one or both sides of the web as it is drawn past them with minimum tension, being fed to the machine from a plaited pile or scray. Several such machines may follow one another for the various processes, e.g. desizing, scouring, dyeing, and drying. C. O. C.

Applying Liquid to a Web. E. Fars. *BP* 658,289

The liquid is applied by a roller through an endless flexible sieve passing between the roller and the cloth or other web. The sieve is kept under constant tension by a heavy roller which rests freely on it. C. O. C.

Drying and Shrinking Textile Fabrics. F. R. Redman. *BP* 658,728

In a festoon drier each loop of fabric is supported by a basket so as to eliminate tension in it during drying. The machine is particularly suitable for tubular knit fabric. C. O. C.

Heating Drying Cylinders. American Viscose Corpn. *BP* 658,147

Continuous Dryer for Paper, etc. having Improved Means for Recovering Heat from the Water Vapour Removed. British Thomson-Houston Co. *BP* 658,398

Plates for Embossing, Printing, etc. Ciba. *BP* 659,766

A composite plate with an imprinted surface layer, the imprint being undistorted by the pressure used in embossing, etc., comprises a rigid backing plate upon which a thin imprinted foil of ductile metal is firmly fixed by an adhesive containing a synthetic resin, such that it can be cured without giving off volatile substances in quantities sufficient to disturb the relationship of the plate and foil or the accuracy and sharpness of the imprint, or by a fibre layer containing such an adhesive. C. O. C.

Thermoplastic Materials having Grained or Patterned Surfaces. Dunlop Rubber Co. *BP* 660,279

The design to be reproduced is photographed, and several enlarged positive prints are placed on a backing to form a mosaic proportional in size to the length and circumference of a roller. This mosaic is then photographed to produce a negative of the same size. This negative is used to prepare an etched roller which is used for hot embossing. C. O. C.

Mounting Silk Gauze for use as a Screen in Printing or Stencilling Machines. W. P. McCormick. *BP* 658,353

The gauze is stretched to the required tension on a stretching device, then secured to a rigid unitary frame placed within the stretching device, and finally cut around the outside of the frame. C. O. C.

Combined Printing and Embossing Die. E. C. V. Oldofredi. *USP* 2,549,847

A design is embossed into a wire-mesh printing die, and then the embossed area flattened to produce a die having a design area differing in structure from the surrounding area. C. O. C.

Automatic Laundry Washing Machine. H. J. Rand Washing Machine Corpn. *BP* 661,038

Removing Water or other Liquid from Garments, etc. L. M. Kahn. *BP* 657,700

The garments are placed in a container in which a piston is mounted. In addition there are in the container one or more inflatable bags or membranes which when inflated squeeze liquid from the garments. The piston serves to compress the garments and lock them in position before inflation of the bags or membranes is started. C. O. C.

Drum Drying Machine for Garments, etc. H. J. Preller. *BP* 657,505

Automatic Control Apparatus for Driers. F. W. Howland. *BP* 660,937

Laundry Drying Machine. Sussex Laundry. *BP* 660,991

Stripping Ironed Work from Flatwork Ironing Machines. S. C. Crook. *BP* 661,119

Garment Press. Brown & Green and R. P. Gudgeon. *BP* 657,291

In presses where there are several tables served in turn by a single press-head, a positive drive is provided to carry the tables round and place them in turn beneath the press-head. C. O. C.

Garment Pressing. G. H. Bishop Co. *BP* 660,264

An outside shoulder-pressing machine is described. *BP* 660,266

A machine for pressing children's and other small garments. C. O. C.

Garment Pressing. R. G. Whitaker. *BP* 659,440

Laundry Presses. E. Haytock. *BP* 660,280

Garment Press. Stanley Newbery. *BP* 661,013

Flame Spraying of Metals or Organic Compounds. R. A. Wiese. *BP* 657,300

II—WATER AND EFFLUENTS

PATENT

Anti-foaming Composition for Boilers. National Aluminate Corpn. *BP* 659,925

A non-ionic diether of a polyoxyalkylene glycol (0·001–0·1 grain/gal.) of mol.wt. not < 500, in which the polyoxyalkylene group has different C atoms attached to terminal ether groups having alkyl, alicyclic, or aralkyl radicals, is used. C. O. C.

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

Action of Aromatic Diazo Compounds on Alkylacetoacetic Esters as a Method of Preparing Arylhydrazones, α-Keto Acids, α-Amino Acids, and Derivatives of Indole. XII—Synthesis of DL-Methionine. V. V. Feofilaktov and T. N. Ivanova. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1684–1689 (Sept. 1951).

Following Feofilaktov's general method for the synthesis of amino acids, ethyl 3-methylthio-1-acetylbutyrate, obtained in 54% yield from acetoacetic ester and 2-chloroethyl methyl sulphide, is treated with diazotised aniline to give the phenylhydrazone of 3-methylthio-1-ketobutyric acid (or its ethyl ester, according to conditions) in 73% yield, and this is reduced with Zn and acid to give DL-methionine in 49% yield. A. E. S.

Aqueous Solutions of Sodium Benzenesulphonate and Monosubstituted Derivatives—Some Physicochemical Properties. P. W. Reinch and R. Taft. *Ind. Eng. Chem.*, **43**, 2376–2384 (Oct. 1951).

The density, viscosity, surface tension, conductivity, and refractive index of aqueous soln. of sodium benzenesulphonate and its *p*-chloro, *p*-hydroxy, *p*-amino, and *p*-methyl derivatives have been measured by conventional methods at concn. of 0·005–1·0 molal and at temp. of 0°, 25°, 45°, and 60° C. The freezing point depression has been measured over the same concn. range, and the solubility over the same temp. range. Density, viscosity, conductivity, refractive index, and freezing point depression of all five compounds show normal values for organic salts in water. The solubility of sodium *p*-methylbenzenesulphonate increases rapidly from 0° to 15°C., and hydrate formation may be possible. The surface tension of sodium *p*-hydroxy- and sodium *p*-aminobenzenesulphonate solutions increases with increasing concn., the other three salts giving decreasing surface tension with increasing concn. The conductivity data are compared with corresponding data for substituted benzoic acids, and some possible errors are noted. A. J.

Organic Orthotitanates. N. M. Cullinane, S. J. Chard, G. F. Price, B. B. Millward, and G. Langlois. *J. Appl. Chem.*, **1**, 400–406 (Sept. 1951).

*iso*Amyl and *iso*octyl titanates have been prepared by the ammonia method (cf. J.S.D.C., **67**, 155 (April 1951)), and *n*-amyl and allyl titanates by a transesterification process. Physical properties of these and other titanates are described. In general the molecular weights determined cryoscopically have been found to be approximately double the values calculated from the molecular formulæ, and structural formulæ are suggested to account for these results. W. K. R.

Mineral Oil as a Wool Lubricant; Emulsification of Blends of Mineral Oil and Wool-wax Alcohols. E. V. Truter. *J. Appl. Chem.*, **1**, 254–257 (June 1951).

Results are presented which show the suitability of blends of mineral oil and wool-wax alcohols for use as wool oils. The blends are stable at 0°c., and are easily removable from wool; the flash points are well above 340°F., and negligible discoloration takes place on exposure to the light of a carbon arc for 30 hr. The isolation of these alcohols from various sources is described. A. B.

PATENTS

Inhibiting the Rust-promoting Property of Polyalkylene Oxides. N.V. De Bataafsche Petroleum. *BP* 659,072

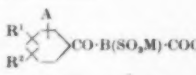
Addition of 0·05–5·0% by weight of a metallic hydrocarbon-sulphonate and a smaller amount of a water-insoluble fatty acid to polyalkylene oxides inhibits their rust-promoting property. C. O. C.

Sizing and Lubricating Composition. British Nylon Spinners. *BP* 659,380

A composition for sizing and lubricating textiles, especially nylon knitting yarn, is obtained by emulsifying a mixture of a mineral oil, a soap, and not > 30% on the weight of the oil of a polyhydric alcohol incompletely esterified with a fatty acid of > 8 C in an aqueous solution or dispersion of a hydroxylated polyvinyl resin. C. O. C.

Water-soluble Salts of Benzoylsulphopropionic Esters—Surface-active Agents. E. F. Houghton & Co. *USP* 2,548,017

Compounds of formula—



(R^1 = H, phenyl, *cyclo*hexyl, or Alk of 1–9 C; R^2 = H or Alk of 1–9 C when R^1 = the same, or H when R^1 = phenyl or *cyclo*hexyl; A = H or Cl, but can only be H when R^2 = Alk; R^3 = Alk of 1–9 C, phenethyl, methyl*cyclo*hexyl, or *cyclo*hexyl; B = an ethylene group; M = a cation conferring water-solubility; $R^1 + R^2 + R^3$ contain 8–16 C), e.g. the Na salt of 2-ethylhexyl *sec.*-amylbenzoylsulphopropionate, have outstanding wetting properties.

USP 2,548,018

Similar properties are possessed by compounds in which R^1 = H or Alk of 1–6 C; R^2 = H or CH_3; A = H or Cl, but only H when R^2 = H; R^3 = Alk of 10–16 C; and $R^1 + R^2 + R^3$ contain 10–16 C.

USP 2,548,019

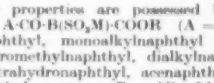
In this case R^1 = Alk of 10–15 C; R^2 = H or CH_3; A = H or Cl, but only H when R^2 = H; R^3 = Alk of 1–6 C; and $R^1 + R^2 + R^3$ contain 10–16 C.

USP 2,548,020

Similar properties are possessed by compounds of formula A·CO·B(SO_3M)·COOR (A = naphthyl, monochloronaphthyl, monoalkylnaphthyl (Alk of 1–11 C), monochloromethylnaphthyl, dialkylnaphthyl (Alk of < 11 C), tetrahydronaphthyl, acenaphthenyl, or fluorenyl; B = an ethylene group; R = Alk of 1–12 C; M = cation conferring water-solubility; R + Alk of A contain 4–12 C).

USP 2,548,021

Compounds of formula—



(R^1 = phenyl, monochlorophenyl, monoalkylphenyl, or monoalkylchlorophenyl (Alk of 1–9 C), monoalkyltolyl (Alk of 1–8 C), diphenylyl, phenylchlorophenyl, *cyclo*hexylphenyl, *cyclo*hexylchlorophenyl, naphthyl, monochloronaphthyl, methylnaphthyl, or tetrahydronaphthyl; R^2 = H or Alk of 1–5 C; R^3 = H or Alk of 1–2 C; $R^2 + R^3$ contain < 6 C and $R^2 + R^3$ + Alk of R^1 contain < 11 C; B = an ethylene group; M = a cation conferring water-solubility) have similar properties. C. O. C.

Emulsifying Agents. Benningn (Mitcham). *BP* 657,630

The compounds produced by the incomplete esterification of glycerol with higher polyhydroxy fatty acids, e.g. 9:10-dihydroxystearic acid, are emulsifying agents of very high surface activity.

BP 657,659

Emulsifying agents are produced by the incomplete esterification of estolised higher polyhydroxy fatty acids with glycerol. C. O. C.

Wetting and Detergent Materials. Anglo-Iranian Oil Co. *BP* 657,598

Shale oil fractions of b.p. 150–350°c., largely free from nitrogen bases and phenolic bodies, are sulphated by adding 2·8–18 vol. of 90% H_2SO_4 per 100 vol. of feed liquor at not > 20°c., separating into an acid lower and an oily

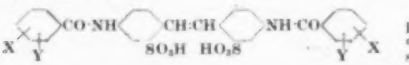
upper layer, treating the upper layer with excess alkali-metal carbonate, and thus recovering an aqueous solution of surface-active agent (10% detergent yield on dry wt. basis of original oil fraction). J. W. B.

Strongly Foaming Detergent. General Aniline. *BP* 658,512

A mixture of a diethylene glycol monoalkyl ether, an ion-sequestering agent, and a long-chain fatty acid tauride or its *N*-alkyl derivative, long-chain fatty acid sarcoside, or long-chain fatty acid ester of a hydroxyalkanesulphonic acid is a liquid detergent having strong foaming properties. C. O. C.

Fluorescent Stilbene Derivatives. General Aniline. *BP* 660,868

Compounds of formula—



(X and Y = lower alkoxy groups or together = O·R·O (R = methylene or ethylene)) fluoresce white or greenish white under ultraviolet radiation. C. O. C.

Starches soluble and dispersible in Cold Water. Corn Products Refining Co. *BP* 658,525

Laundry starch readily dispersible and soluble in cold water is prepared in dry form by subjecting an aqueous starch slurry to simultaneous hot-water gelatinisation and mechanical disruption in colloidal solution at at least as high a temperature as will normally gelatinise the starch. The starch is then enzyme-converted at raised temp., e.g. 190°F., with an enzyme able to hydrolyse starch molecules into large substantially non-reducing segments, the enzyme is inactivated, and the solution dried. J. W. B.

Titanated Polyvinyl Resins—Adhesive, Sizing, Coating, and Impregnating Agents. DuP. *USP* 2,549,940

The products obtained by treating a polyvinyl ester or acetal with a reactive titanium compound have a higher softening point and tensile strength and are less sensitive to water than the untitanated polyvinyl compounds. C. O. C.

Three-phase Emulsions of Synthetic Resins especially suitable for treating Textiles. Ciba. *BP* 659,395

An inert water-immiscible organic liquid, b.p. 100–200°C., is incorporated as a second disperse phase into an emulsion of a water-insoluble hardenable formaldehyde–amide–water-insoluble alcohol condensate in an aqueous solution containing a protein and urea and/or thiourea. The products can be used for finishing textiles or with the addition of pigments as printing pastes which yield prints fast to rubbing and washing. C. O. C.

Amide Derivatives—Finishing Agents. Ciba. *BP* 657,422

At least 1 mol. of an alkylene oxide is treated with 1 mol. of condensation product, containing the grouping —CO·N·CH_2·O·C—, having at least 1 reactive H, and being in turn obtainable by reaction of a carboxyamide having at least 1 H on the amide N, formaldehyde, and a hydroxyalkylamine. In one example the condensation product $R{\cdot}CO{\cdot}NH{\cdot}CH_2{\cdot}O{\cdot}CH_2{\cdot}CH_2{\cdot}N(CH_2{\cdot}CH_2OH)_2$ (R = the acyl residue of commercial stearic acid) (1420 parts by wt.) is heated to 130°C., and finely divided sodium (3–18) added in small portions. Ethylene oxide (454) is introduced at 130–140°C. in fine dispersion, and is easily absorbed. The product gives an opalescent solution in water, and can be used as a softener for viscose rayon. If the above product is heated to fusion (1 part), water (1) added in small portions with stirring, and the paste mixed with Turkey Red oil (2), a product is obtained suitable for vivifying regenerated cellulose fibres. J. W. B.

Aliphatic Polyamides. Nopco Chemical Co. *BP* 657,419

A mixed aliphatic polyamide is prepared by reaction of a polyamine of formula $R^1{\cdot}NH{\cdot}[CR^2R^3{\cdot}CR^2R^3{\cdot}NR^1]_n{\cdot}H$ (*n* = an integer, R^1 = H or hydroxyalkyl, and R^2 and R^3 = H or Alk) with an aliphatic acid containing 8–22 C or an ester thereof, and with an aliphatic acid containing 2–5 C or its ester, anhydride, or acid halide. The product is soluble or dispersible in water, and may be applied to fabrics, without risk of yellowing, to impart good softness, drape, and handling properties. J. W. B.

Foam Inhibitor. Shell Refining & Marketing Co. *BP* 658,494

A suspension in a water-immiscible liquid of a compound containing in its molecule at least two $R^1{\cdot}CO{\cdot}NR^2$ groups (R^1 = Alk or *cyclo*aliphatic radical of > 9 C; R^2 = H or an organic radical) joined together either directly or by a multivalent aliphatic, *cyclo*aliphatic, or aromatic radical, e.g. *NN'*-distearoylethylenediamide, effectively inhibits foam formation in aqueous solutions to which it is added. C. O. C.

Improving the Fastness of Direct Dyeings—Pigments—Animalising Cellulosic Fibres. S. *BP* 657,753

The water-soluble products obtained by condensing a polyalkylene or polyhydroxyalkylenepolyamine (alkylene of 2–3 C) in absence of water, and if desired in presence of a solvent of b.p. > 125°C., with cyanamide, dicyandiamide, or guanidine, at such a temperature that at least 0·5 mol. of ammonia per mol. of cyanamide or 1 mol. of ammonia per mol. of dicyandiamide or guanidine is split off, are basic syrupy or thick almost colourless liquids or solids which form salts with acids. They or their water-soluble salts are used alone or together with a water-soluble salt of a multivalent metal, e.g. copper, for improving the fastness properties of direct dyeings, for preparing pigments, or for animalising cellulosic fibres. They precipitate acid dyes from aqueous solution. C. O. C.

Metal Soaps. Nopco Chemical Co. *BP* 657,815

An alkali-metal soap prepared from hydrogenated castor oil is treated with a water-soluble salt of Al, Pb, Ca, or Zn. The products have a higher m.p. than the corresponding multivalent metal soaps derived from other fatty acids. They are useful for blending with paraffin wax to give waterproofing mixtures having softening points much higher than those hitherto attainable. Many of them are soluble in high-boiling lacquer solvents of the polar type but are relatively insoluble in non-polar solvents. They can be used for imparting to textiles a water-repellent finish which withstands dry cleaning. C. O. C.

Water-repellent Compositions for Textiles. Quaker Chemical Products Corpn. *USP* 2,547,728

A composition which imparts a water-repellent finish of high resistance to washing and dry cleaning comprises a urea- or melamine–aldehyde resin soluble in organic solvents, a substituted urea of formula $R^1{\cdot}NH{\cdot}CO{\cdot}NH{\cdot}R^2$ (R^1 = Alk of > 11 C; R^2 = H or a hydrocarbon radical), e.g. dodecylurea, and a diamide of formula—

$$R^3{\cdot}CO{\cdot}NH{\cdot}R^4{\cdot}NH{\cdot}CO{\cdot}R^3$$

(R^3 = Alk of > 11 C; R^4 = alkylene of > 5 C), e.g. hexamethylenedistearamide. C. O. C.

Fire-retardant Stable Bori-borate Compositions for rendering Textiles Flame-resistant. U.S. Finishing Co. *USP* 2,550,134

Condensation of boric acid (70 parts), borax (80), and a polyhydric alcohol (83·5) followed by addition of 6–8% by weight of an amino compound yields a product which is stable on long storage and gives an excellent fire-retardant finish to textiles. C. O. C.

Fireproofing Composition. Philadelphia Textile Finishers. *USP* 2,547,671

The products obtained by treating antimony trioxide with the anhydride of an organic carboxylic acid, e.g. acetic, chloroacetic, or benzoic anhydride, are fireproofing agents for textiles, paper, etc. C. O. C.

Fireproofing Compositions. Monsanto. *BP* 658,107

Mixtures of 70–85% diammonium phosphate, 21–11% borax, and 9–4% boric acid used in aqueous solution for flameproofing textiles alter the handle very little, as on drying they are deposited on the fibre as a non-crystalline residue of a glassy or resinous character. C. O. C.

Insecticidal Finishing Agent. FBy. *BP* 660,305

Textiles, etc. impregnated with dialkyl coumarinyl thiophosphates are rendered insecticidal; e.g. wool cloth containing 0·25% by weight of dimethyl 4-methyl-7-coumarinyl thiophosphate kills moth larvæ placed on it in a few hours and bed bugs in 72 hr. Cotton similarly impregnated with the corresponding diethyl ester killed lice in 10 hr. C. O. C.

Bactericidal and Bacteriostatic Preparations. B. F. Goodrich Co. *BP* 657,739

Compounds of formula—

e.g. 2:3-diphenylindole, have powerful bactericidal and bacteriostatic activity even at concentrations of 1–100 p.p.m. C. O. C.

Rosin Ammonium Phenoxides as Fungicides. Hercules Powder Co. *BP* 660,171

The products obtained by treating rosin amines with phenols have very good fungicidal properties, do not bloom, and are insoluble in water. They are suitable for rotproofing textiles and paints, etc. C. O. C.

Coatings and Adhesives. H. Ewing and A. Mellor. *BP* 658,180

Polyvinyl chloride plasticised with a diester of a non-benzenoid monocyclic alcohol and a dicarboxylic acid in which the two carboxyl groups are separated by < 4 C will adhere firmly to cellulose acetate. It can be used for bonding a fabric of acetate rayon to another fabric of acetate rayon or other fibres. C. O. C.

Alkaline Aquasols and Organo-aquasols of High Stability. Monsanto. *BP* 660,593

A dilute solution of a compound of pH not < 9 is mixed with an acidic organo-aquasol of pH 2–4 containing an inorganic oxide, e.g. silica, to yield a colloidal solution of pH > 8. C. O. C.

Thixotropic Film-forming Solution of Acetone-insoluble Polyvinyl Chloride. H. Ewing. *BP* 658,197

A mixture of ethyl methyl ketone and an aliphatic ketone containing 5–7 C dissolves acetone-insoluble polyvinyl chloride in the cold. Such solutions may be used for forming self-supporting films, but their principal uses are in coating textiles and films, as bonding agents for textiles, etc. C. O. C.

Wrinkle Finishes. Pittsburgh Plate Glass Co. *USP* 2,548,388

A coating composition whose drying can be controlled to provide a wrinkle pattern of desired grain is obtained by heating carbic (3:6-*endo*methylenetetrahydrophthalic) anhydride (1 mol.) with a monoglyceride of an acid of a drying glyceride oil (0·1–0·4 mol.) and diethylene glycol (sufficient of the two latter ingredients to give 10–25% excess of hydroxyls over carboxyls) at 350–450°F. for 16–20 hr. C. O. C.

Colour and Stain Removers for Fabrics. Best Foods. *USP* 2,548,892

A composition readily soluble in water to give a liquid which can be used above 175°F. on any type of fabric, irrespective of the fibres it contains, comprises basic zinc formaldehyde-sulphoxylate (100 parts by weight), an α-hydroxycarboxylic acid of dissociation constant 5×10^{-2}–5×10^{-4} at 25°C. (45–200), e.g. tartaric acid, and a nitrogenous organic cationic material substantive to cellulosic material, e.g. acetate rayon, and containing > 11 C (1–20), e.g. *p*-diisobutylphenoxyethoxyethyl-dimethylbenzylammonium chloride.

USP 2,548,914

The acid used is succinic acid (200–700).

USP 2,549,079

The acid used is oxalic acid (37–41).

USP 2,549,113

The acid is replaced by monocalcium, monosodium, or monoammonium orthophosphate (40–250). C. O. C.

Stripping Agent for Polysulphide Elastomer Coatings. Lockheed Aircraft Corpn. *USP* 2,548,718

A mixture of a solvent or swelling agent for the elastomer and a depolymerising agent consisting of the reaction product of a dialkylamine and CS_2 and/or a thiol is used. It disintegrates the elastomer to a crumbly, lifeless condition, in which it is readily washed off the material coated with it. C. O. C.

Coating and Adhesive Compositions containing Methyl-substituted Polysiloxanes (V p. 36).

Mordanted Dye Layers for Photographic Purposes (IX p. 41).

Carboxyalkyl Methyl Ethers of Cellulose (XI p. 44).

Fire Hazards of Oils in the Woollen Industry (XIV p. 46).

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Rise and Development of the Wool Dyes. A Brief Historical Survey. J. Baddiley. J.S.D.C., **67**, 546–556 (Dec. 1951).

Milestones in the Production of Synthetic Dyes for Cellulosic Fibres. C. M. Whittaker. J.S.D.C., **67**, 492–494 (Dec. 1951).

Modification of Crystal Habit of Inorganic Salts with Dyes. J. Whetstone. *Nature*, **168**, 663–664 (13 Oct. 1951).

A dye should have the following properties to modify crystal habit—(1) high solubility in the saturated saline solution; (2) charge centres of the polar groups should coincide accurately with sites for similarly charged ions in the crystal plane; and (3) such polar groups should not disturb the lattice about the ionic site in question. Practical study is possible only with simple dyes which can be obtained very pure, and prediction of modifier structure is hindered because it is impossible to predict dye solubility. J. W. B.

Dyes and Enzyme Reactions—II. W. Diemair and H. Häusser. *Z. Lebensm.-Unter uch. u. -Forsch.*, **92**, 403–407 (1951): *Chem. Abs.*, **45**, 7711 (10 Sept. 1951).

The inhibiting action of 17 food dyes on diastatic decomposition of 10% aq. farina is shown in tables and graphs. 0·1–0·5 mg. Orange GG per 10 c.c. of starch suspension inhibited saccharification but not liquefaction, whereas Rhodamine B and Fast Green 8F inhibited liquefaction but had only slight effect on saccharification. Nigrosine LR and Erythrosin strongly inhibited both effects. The amounts of dyes used correspond to concentrations used in colouring foods, so that it would seem that the practice of using them must have a detrimental action on digestion in the organism. In addition to the above-mentioned dyes data are also given on Brilliant Black, Patent Blue AE, Naphthol Red SCC, Orange SCC, Bordeaux R, Fast Red E, Naphthol Yellow S, Ponceau 6R, Cochineal Red A, Fast Yellow Extra, Rhoduline Orange NO, and Tartrazine XX. C. O. C.

Addition of Aniline to Olefinic Double Bonds in presence of Heterogeneous Catalysts. N. N. Vorozhtsov and I. I. Ioffe. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1659–1660 (Sept. 1951).

A mixture of aniline and *iso*propylethylene, heated at 260°C. under 30 atm. in presence of activated kaolin as catalyst, yields *p-tert.*-amylaniline (14·5% yield) and secondary amines (2% yield), including 2-methyl-3-phenylamino-*n*-butane and 2-methyl-2-phenylamino-*n*-butane. A. E. S.

Quaternary Ammonium Salts. II—Formation and Decomposition of Diethylmethylanilinium Salts. Route to *N*-Ethyl-*N*-methylanilines. H. A. Fahim and A. M. Fleifel. *J.C.S.*, 2761–2762 (Oct. 1951).

Diethylanilines, now obtained in good yields from the primary bases by treatment with ethyl sulphate, give the quaternary diethylmethylanilinium salts more readily with methyl iodide than with methyl sulphate. The quaternary salts from diethyl-*m*- and -*o*-toluidine and methyl iodide form at room temperature, but *o*-chloro-*NN*-diethyl-, *NN*-diethyl-*o*-, -*m*-, and -*p*-nitro-, and *NN*-diethyl-4-methyl-2-nitroaniline do not afford the quaternary salt under any conditions tried with either reagent. Thermal or alkaline decomposition of the quaternary salts studied occurs smoothly in one direction to give invariably the *N*-ethyl-*N*-methylanilines, except that *NN*-diethyl-*N*-methyl-*p*-phenetidinium iodide gives diethyl-*p*-phenetidine. H. H. H.

Action of Elements of the Oxygen Group (Sulphur and Selenium) on Aromatic and Heterocyclic Primary Amines. P. S. Pishchimuka. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1689–1699 (Sept. 1951).

Aromatic amines, e.g. aniline, will react with S only at high temp., when attack occurs in the nucleus giving diaminodiphenyl sulphide. Hydrazobenzene and azobenzene are not formed, for the H_2S that would arise at the

same time would attack them with regeneration of aniline. If, however, there is a substance present that will absorb the H_2S as soon as it is formed, these reactions may proceed. Certain Hg compounds that contain nitrogen, or that form an addition cpd. with the amine used, are particularly effective for this purpose. It is found that for a cpd. to be effective, the Hg atom must be directly linked to N. If the Hg cpd. contains the grouping O–Hg–N, being e.g. an ammine of the Hg salt of an oxy-acid, then not even a trace of azo cpd. is formed. Reaction is then slow and proceeds only to the hydrazobenzene stage, at which, under the conditions of the reaction, benzidine and *o*- and *p*-semidine rearrangements occur, followed by internal condensation or reaction with S to give azine and thiazine dyes as final products. If the Hg cpd. contains the grouping >N·Hg·N<, being e.g. the Hg deriv. of an amide or imide, then dehydrogenation proceeds rapidly, giving a good yield of azobenzene. In addition, some azine and thiazine dyes are produced, for the Hg compounds used are mixtures of three tautomers containing the groupings -O·Hg·O-, -O·Hg·N<, and >N·Hg·N< respectively. A discussion is given of the influence of reaction conditions on the relative amounts of the tautomers and on the rates of their interconversion; these factors largely determine the course of the dehydrogenation reaction. Forty active Hg compounds and 26 active aromatic and heterocyclic primary amines were examined; the amines that failed to react all contained *o*-nitro groups. It is found that Se behaves like S in these reactions, yielding azo compounds, azines, and selenoazines; it does not react with aromatic amines in absence of an active Hg cpd. Red selenium (probably Se_8) reacts much more readily than sulphur (S_8), although, unlike selenium, sulphur is sol. in the solvents used (hydrocarbons and chlorinated hydrocarbons). The difference is attributed to the difference in molecular size. It is found that, whereas the activity of red Se normally disappears on heating to 90°c., it is retained up to 150°c. in presence of the nitrogen-containing Hg compounds. A. E. S.

4:5-Dinitroanthranilic Acid. H. Goldstein and R. Jaunin. *Helv. Chim. Acta*, **34**, 1860–1868 (Oct. 1951).

4:5-Dinitroanthranilic acid is obtained by nitration of 4-nitro-2-acetamidobenzoic acid followed by hydrolysis of the 4:5-dinitro-2-acetamidobenzoic acid so prepared. In this compound the 4-nitro group is mobile, and may be directly replaced by an amino, anilino, or methoxyl group. In the corresponding diazo compound, however, it is the 5-nitro group which is mobile and readily replaced by a hydroxyl group or a chlorine atom. H. H. H.

Sulphonation Reaction. XVII—Hydrolysis of Sulphonic Acids in presence of Hydrochloric, Sulphuric, and Phosphoric Acids. A. A. Spryskov and N. A. Ovsyankina. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1508–1511 (Aug. 1951).

Measurements of the rate of hydrolytic desulphonation of *α*-naphthalenesulphonic acid and of 5-sulphosalicylic acid show that hydrochloric acid has a much greater accelerating effect than sulphuric acid, while phosphoric acid has scarcely any accelerating action even at a concn. of 60%. A. E. S.

Derivatives of 2-Naphthol-4-sulphonic Acid. II—Sulphonation of 2-Naphthol-4-sulphonic Acid. S. V. Bogdanov and I. B. Migacheva. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1511–1513 (Aug. 1951).

No sulphonation occurs in the 1-position when 2-naphthol-4-sulphonic acid is treated with 20% oleum at 3–18°c. This contrasts with the exclusive 1-sulphonation that results from treatment with sulphite in presence of an oxidising agent. The product of sulphonation by oleum is compared with the 4:8- and 4:6-sulphonic acids of 2-naphthol (prepared from the corresponding 2-naphthylamine derivatives) and shown to be identical with the former. A. E. S.

Aromatic Diazo Compounds. III—Coupling with H Acid. Z. J. Allan and J. I. Dobáš. *Chem. Listy*, **44**, 227–230 (1950): *Chem. Abs.*, **45**, 7992 (25 Sept. 1951).

When coupling diazotised amines with H acid, J acid, and *γ* acid—(1) lowering the pH favours NH_2 coupling (next to the NH_2 group), while increasing the pH favours OH coupling (next to the OH group); (2) H acid strongly tends to OH coupling and J and *γ* acids to NH_2 coupling; (3) negative substitution on the amino component favours NH_2 coupling. Determination of the coupling position was carried out as follows—The mixture of isomeric dyes was acidified with 100% $1\text{-}C_{10}H_7\cdot SO_3H$ and 2 N-H_2SO_4 and titrated with 0·5 N-$NaNO_2$ at 15°c. using KI-starch paper as indicator. The NH_2 group next to the coupling position does not react, so that the titration determines the OH coupling. Coupling was carried out in $NaHCO_3$, Na_2CO_3, and Na acetate–acetic acid solutions. C. O. C.

Reactions between Diazonium Salts and Furfural. H. Akashi and R. Oda. *Rept. Inst. Chem. Research, Kyoto Univ.*, **19**, 93–94 (1949): *Chem. Abs.*, **45**, 7519 (10 Sept. 1951).

A number of arylfurfurals have been synthesised in 30–96% yield by adding 1 mol. of furfural in acetone or water and then aq. $CuCl_2$ gradually to 1 mol. of diazotised aromatic amine at 20–30°c. with stirring. Their uses in dyemaking are described. C. O. C.

Possibility of Geometrical Isomerism among the 1-Aryl-3:3-dimethyltriazens. R. J. W. Le Fèvre and T. H. Liddicoet. *J.C.S.*, 2743–2748 (Oct. 1951).

The dipole moments and ultraviolet absorption spectra of several 1-aryl-3:3-dimethyltriazens appear to indicate *trans*-configurations about the N:N group. The mesomeric polarisations run parallel to those noted in the literature for dimethylaniline and its derivatives. Exposure to sunlight causes mainly photodecomposition, with, however, slight indications which resemble phenomena shown by other azo derivatives, and which are claimed not to be inconsistent with the occurrence of a reversible *trans* ⇌ *cis* change. H. H. H.

Azo Dyes from 1:5-Aminonaphthol and some of its Derivatives. VIII—Absorption Spectra of some Intermediates and Azo Dyes of the Naphthalene Series. V. V. Perekalin and M. V. Savostyanova. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1329–1340 (July 1951).

Measurements were made of the absorption spectra in the range 210–600 m*μ*. of 1:5-aminonaphthol and its monosulphonic acids, of dyes derived from these intermediates by the introduction of one or two phenylazo groups, and of certain simpler substances for comparison purposes. 28 substances were examined, 21 for the first time. As well as the neutral molecules, the anions and cations obtained in alkaline and acid soln. respectively were examined. Aqueous and alcoholic solutions were used. The three absorption maxima of the naphthalene spectrum are repeated in a modified form in the spectra of all the substances examined. The max. at 220 m*μ*. is found almost unchanged in all the spectra. The second max. (275 m*μ*. in naphthalene) varies in position according to the substituents present and may obscure the third max. (319·3 m*μ*. in naphthalene), which appears to be little affected by substituents. In the azo dyes other long-wave maxima appear. The positions of these are generally greatly affected by addition of acid or alkali, but the maxima of *o*-hydroxyazo and *peri*-hydroxyazo dyes are unaffected by the addition of caustic soda to the soln. This is attributed to the effect of internal hydrogen bonds present in these dyes. A. E. S.

Absorption Curves of some Monoazo Dyes. J. N. Ospenson. *Acta Chem. Scand.*, **5**, 491–509 (1951): *Chem. Abs.*, **45**, 8773 (10 Oct. 1951).

The preparation of *α*-anthrol and *β*-anthrol by reduction and KOH fusion of the corresponding Na anthraquinonesulphonates is described. The monoazo compounds *p*-phenylazophenol, 4-phenylazo-1-naphthol, 4-phenylazo-1-anthrol, *o*-phenylazophenol, 1-phenylazo-2-naphthol, 1-phenylazo-2-anthrol, and their methyl ethers were prepared, and absorption curves of these 12 dyes in 96% ethanol were obtained. The location of the azo and hydrazone bands and the configuration of the *O*-methyl and *N*-methyl derivatives are discussed in detail. E. S.

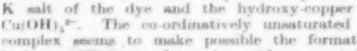
Studies of Metallated Dye Complexes. I—Copper (II) Complex with *oo'*-Dihydroxyazobenzene. H. B. Jonassen, M. M. Cook, and J. S. Wilson. *J. Amer. Chem. Soc.*, **73**, 4683–4684 (Oct. 1951).

Spectrophotometric and conductometric investigation of the complex compound formed between *oo'*-dihydroxyazobenzene and the cupric ion has confirmed a previously postulated 1 : 1 Cu^{II}-dye complex. In presence of KOH a monohydroxy Cu^{II}-dye complex is formed. Further

addition of the base breaks up the complex forming the K salt of the dye and the hydroxy-copper complex $Cu(OH)_2$. The co-ordinatively unsaturated Cu^{II}–dye complex seems to make possible the formation of a hydroxy-copper complex anion without precipitation of copper hydroxide. C. O. C.

Azoic Pigments having Furoyl Groups. IV — Disazo Dyes from Acylacetarylides. R. Andrisano and R. Passerini. *Ann. chim.* (Rome), **40**, 439–441 (1950): *Chem. Abs.*, **45**, 8775 (10 Oct. 1951).

Various acylacetarylides were coupled with tetrazotised benzidine to give disazo pigments—



(R = CH_3, phenyl, or furyl; Ar = phenyl, phenyl subst. with CH_3, O·CH_3, Cl, etc., or α- or β-naphthyl). The products were crystallised from nitrobenzene, and their m.p. and crystalline form recorded.

V — Monoazo Dyes from Methylfuroylacetarylides. R. Andrisano and L. Maioli. *Ibid.*, 442–444: *Chem. Abs.*, **45**, 8775 (10 Oct. 1951).

Monoazo pigments—

(Ar as above, but at least one Ar = C_6H_5) were also prepared and crystallised from acetic acid, and their m.p. and crystalline form recorded. E. S.

Metal Indicators. IV — Acidity Constants and Iron Complexes of Chromotropic Acid. J. Heller and G. Schwarzenbach. *Helv. Chim. Acta*, **34**, 1876–1889 (Oct. 1951).

Photoconductivity of some Triphenylmethane Dyes. C. Nelson. *J. Chem. Phys.*, **19**, 798 (1951): *Chem. Abs.*, **45**, 7868 (25 Sept. 1951).

Vartanyan's experiments (*Chem. Abs.*, **41**, 2988 (1947)) have been repeated with the addition of Brilliant Violet, Methyl Green, and Methyl Violet hydrochloride to the list of dyes used. Much higher ratios than Vartanyan's for conductivity illuminated : conductivity dark were found for Crystal Violet, Malachite Green, and Methyl and Brilliant Violets. Apparently the mechanism of conduction involves the transfer of carriers from the conjugated double-bond system to an ionic lattice, probably unidimensional, in which the long-range movement of charge occurs. C. O. C.

Hydroxyfuchsone Dyes. XIII — Acetylation of Hydroxymethoxyfuchsones. I. S. Ioffe. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1316–1329 (July 1951).

It was shown by Eydlin and Postovsky (cf. *Chem. Abs.*, **42**, 152g (1948)) that hydroxyfuchsone dyes containing methoxyl groups *ortho* to the hydroxyls behave abnormally when acetylated in presence of HCl. On hydrolysis the acetylation product yields not the original dye but a colourless substance, which was considered to be a dimer of a free radical of the triphenylmethyl type. This conclusion is now refuted, the substance obtained being shown to be a fluorene deriv., formed by the isomerisation of the hydroxymethoxyfuchsone in presence of acid (see *J.S.D.C.*, **66**, 449 (Aug. 1950)). A. E. S.

Hydroxyfuchsone Dyes. XIV — Structure of Bisulphite Derivatives of Hydroxyfuchsone Dyes. I. S. Ioffe. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1514–1517 (Aug. 1951).

The colourless bisulphite cpd. of a hydroxyfuchsone dye, previously considered to be a sulphurous ester of the carbinol form, is shown to be probably an α-hydroxysulphonic acid resulting from an addition reaction at the carbinol group of the dye. When the bisulphite cpd. is hydrolysed with alkali, the first product is found to be the dye itself, while hydrolysis of acetylation products of the dye, which are known to be derived from the carbinol, leads directly to the carbinol form. A. E. S.

Hydroxyfuchsone Dyes. XV — Acetoxyfuchsones. I. S. Ioffe. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1677–1683 (Sept. 1951).

Hitherto, attempts to acetylate hydroxyfuchsone dyes have led to loss of the quinone structure and the formation of a colourless polyacetoxytriphenylcarbinol. It is now shown that rubrocol (3:3′:3″-trimethoxyaurin) yields a golden-orange diacetyl deriv. when acetylated under mild conditions. This may be effected by grinding the hydrochloride of the dye with anhyd. sodium acetate in presence of a little acetic anhydride, or by dissolving the dye in a mixture of pyridine and acetic anhydride. Some properties of the product are described. On acetylating further it yields the expected colourless triacetylcarbinol. A. E. S.

Oxidation of Indigo for the Preparation of Isatin. S. K. Saha. *J. Indian Chem. Soc., Ind. and News Ed.*, **13**, 178 (1950): *Chem. Abs.*, **45**, 8004 (25 Sept. 1951).

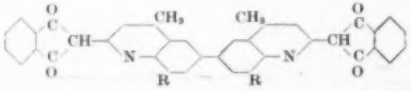
Oxidation of indigo by a mixture of H_2SO_4 or HCl and $Na_2Cr_2O_7$ gives over 90% yields and is superior to the HNO_3–dichromate method. C. O. C.

Relation between the Absorption Spectra and the Chemical Constitution of Dyes. XXIV — Absorption Spectra of some Thioindigo Dyes in Sulphuric Acid. W. R. Brode and G. M. Wyman. *J. Amer. Chem. Soc.*, **73**, 4267–4270 (Sept. 1951).

Absorption spectra are given over the wavelength range 210–800 mμ. for nine thioindigo dyes, containing mostly methyl and ethoxyl groups or halogens as substituents, dissolved in conc. H_2SO_4. Most of the dyes undergo a slow, irreversible change in their absorption spectra, probably as a result of sulphonation and/or decomposition. Thioindigo dyes substituted in the 4- or 6-position are particularly unstable, especially when irradiated with blue or red light; whereas the spectra of dyes substituted in the 5- and 7-positions show little or no change under these conditions. Comparison of the absorption spectra of most of these dyes in sulphuric acid with their spectra in organic solvents reveals extensive shift of the absorption to lower frequencies and increase in separation between the first (long-wave) absorption band and the absorption peak in the near ultraviolet (300–340 mμ.) region. This is attributed to formation of two hydrogen-bonded rings (similar to that previously postulated for indigo) by addition of two protons by the sulphuric acid. Introduction of methyl groups or halogens into the thioindigo nucleus shows a normal bathochromic effect; the absorption curve undergoes complete change, however, when ethoxy groups are introduced in the 6:6′positions or into bis-4:5-benzothioindigo. C. O. C.

Quinoline Derivatives. VIII — Synthesis of Quinophthalone Direct Dyes from Diamines of the Diphenyl Series. B. I. Ardashev and Z. V. Malina. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1349–1354 (July 1951).

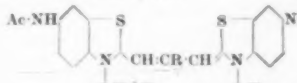
In the original synthesis of quinophthalone dyes by Poray-Koshits (cf. *Chem. Abs.*, **32**, 1458 (1938)) the necessary bisquinaldine intermediates were obtained in low yield by the Doebner–Miller reaction. It is now shown that suitable intermediates may be obtained in fair yield from benzidine, tolidine, or dianisidine by treating with paraldehyde, acetone, and HCl (Beyer's reaction). The products react with phthalic anhydride to give three new direct dyes—



Dyeings on cotton are yellow (R = H), orange–yellow (R = CH_3), or orange (R = OCH_3). A. E. S.

Cyanine Dyes. IV — Certain 6:6′-Bisacylaminothiacarbocyanines. I. I. Levkoev, S. A. Kheyfets, and N. S. Barvyn. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1340–1349 (July 1951).

The thiacarbocyanine dyes—

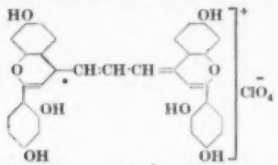


(Ac = H·CO, CH_3·CO, or $CH_3·SO_2$; R = H, CH_3, or C_2H_5; X = I^- or p-$CH_3·C_6H_4·SO_3^-$) are synthesised.

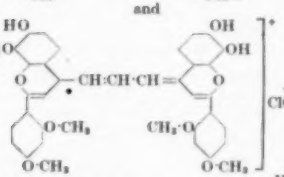
Their absorption spectra and photographic sensitising properties are determined. A. E. S.

Some 2-Phenylbenzopyrylocyanines. C. Michaelidis and R. Wizinger. *Helv. Chim. Acta*, **34**, 1776–1782 (Oct. 1951).

4-Methylflavylium salts react with *p*-dimethylaminobenzaldehyde to give 4-dimethylaminostyrylflavylium salts, in which the bathochromic effect of the dimethylaminostyryl group in combination with the unsubstituted flavylium residue amounts to ~ 285 mμ.; this effect may be appreciably lowered in combination with flavylium residues containing auxochromic groups. Two new types of flavylo-trimethincyanines are described—



and



H. H. H.

2-Arylbenzopyrylium Salts. C. Michaelidis and R. Wizinger. *Helv. Chim. Acta*, **34**, 1761–1770 (Oct. 1951).

In continuation of a systematic investigation of colour and constitution, a number of new 2-arylbenzopyrylium salts have been prepared by condensation of coumarin and 7-hydroxycoumarin with phenols, phenol ethers, and tertiary aromatic amines, and also by condensation of *o*-hydroxyaldehydes with acetophenones. The 2-phenylbenzopyrylium ion is found to be very sensitive to auxochromes. H. H. H.

Synthesis of 4-Methylflavylium Salts from 4-Methylcoumarins. C. Michaelidis and R. Wizinger. *Helv. Chim. Acta*, **34**, 1770–1776 (Oct. 1951).

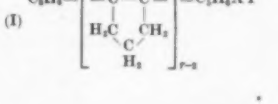
Condensation of 4-methylcoumarins with phenols and phenol ethers gives 4-methylflavylium salts, whose methyl group in the 4-position exerts a definite hypsochromic effect. H. H. H.

Synthetic Colour-forming Photographic Colloids. D. M. McQueen and D. W. Woodward. *J. Amer. Chem. Soc.*, **73**, 4930–4934 (Oct. 1951).

Hydrophilic polymers capable of use as photographic colloids with silver halide to form coloured images are formed by acetalisation of polyvinyl alcohol both with aldehydes capable of coupling with *p*-phenylenediamine colour developers at the site of exposed silver halide and with aldehydes containing water-solubilising groups. The detailed synthesis of a typical member of the series derived from polyvinylalcohol, *m*-1-acetoxy-2-naphthalenesulphonamidobenzaldehyde, and sodium benzaldehyde-*o*-sulphonate is described together with the solution and film properties of this and related polyvinyl acetals. C. O. C.

Catalytic Conversion of a Diene into Deeply Coloured Polyenes. B. Eisler, A. Wassermann, F. D. Farnsworth, D. Kendrick, and R. Schnurmann. *Nature*, **168**, 459–461 (15 Sept. 1951).

A summary of experiments and arguments to establish the formula (I) for the product formed when *cyclo*pentadiene is converted catalytically into a deep red poly*cyclo*pentadiene–trichloroacetic acid adduct—



(I)

(XY = trichloroacetic acid; *r* = number average degree of polymerisation = 18 ± 2). J. W. B.

Relations between Dye Phosphors and Hydrogen Bonds of Rigid Media on the Surface of Adsorbents. D. Yamamoto and R. Iwaki. *J. Chem. Phys.*, **19**, 662 (1951): *Chem. Abs.*, **45**, 7882 (25 Sept. 1951).

Trypaflavin phosphoresced well when adsorbed on high-molecular substances, e.g. cellulose, starch, and various solid proteins, but not on cellulose nitrate. A number of low-molecular substances, e.g. urea and boric acid, are also phosphorescent adsorbents for the dye. C. O. C.

Transfer of Light Energy within the Pigment Systems present in Photosynthesising Cells. L. N. M. Duysens. *Nature*, **168**, 548–550 (29 Sept. 1951).

Annatto. W. Diemair and R. Zacharias. *Z. Lebensm.-Unters. u. -Forsch.*, **93**, 8–17 (1951): *Chem. Abs.*, **45**, 8672 (10 Oct. 1951).

Examination of fresh annatto seed extract, a commercial annatto cheese dye, and a commercial annatto butter dye showed that the seed extract and the butter dye contained bixin as well as carotene and other yellow carotenoids. The cheese dye was an alkaline solution that apparently contained norbixin instead of bixin. C. O. C.

Photodichroism of Solid Carotenoid Solutions—I. W. Kuhn and R. Landolt. *Helv. Chim. Acta*, **34**, 1900–1928 (Oct. 1951).

Experimental data are given on the relationship of wavelength to the photodichroism which occurs when the carotenoids—β-carotene, neo-β-carotene U, lycopin, and the equilibrium mixture of the *cis*- and *trans*-isomers of lycopin, molecularly distributed in solid films of polystyrene, are irradiated with linearly polarised monochromatic light of various wavelengths in the visible and near ultraviolet. Photochemical sensitivity varies appreciably with the wavelength of light employed. The number of light quanta necessary for the complete fading of a carotenoid molecule is $> 10^{12}$ for $\lambda = 5000$ A., $\sim 10^9$ for $\lambda = 4340$ A., and $\sim 10^8$ for $\lambda = 3900$ A. The minimum period necessary for the carotenoid molecule embedded in the solid styrene to execute a rotation of 90° is ~ 3 years. H. H. H.

Photodichroism of Solid Carotenoid Solutions—II. W. Kuhn and R. Landolt. *Helv. Chim. Acta*, **34**, 1929–1936 (Oct. 1951).

The experimental results of Part I (above) are theoretically examined under the headings—amount of relative dichroism, relative dichroism is greatest for wavelengths in the vicinity of the exciting radiation, relative fading is approximately the same in all parts of the spectrum, absence of change of sign in the dichroism at the transition from the main band to the *cis*-peak, and local fixation of the orienting vector and the absorption frequency of the molecule. The latter is established as a new effect. The interpretation of the bleaching of solid solutions of carotenoids is made from a consideration of the changes in vibration states from those in ordinary solutions. H. H. H.

Melanin and its Precursors. III—New Syntheses of 5:6-Dihydroxyindole and its Derivatives. J. D. Bu'Lock and J. Harley-Mason. *J.C.S.*, 2248–2252 (Sept. 1951).

The melanin intermediate, 5:6-dihydroxyindole, has been obtained by oxidation of β-3:4-dihydroxyphenylalanine with potassium ferricyanide and isomerisation of the resulting quinone with zinc acetate (cf. *Nature*, **166**, 1036 (1950)); similarly, oxidation of its ethyl ester and of 2-3′:4′-dihydroxyphenylethylmethylamine with potassium iodate gives red crystalline iodoquinones, also isomerised by zinc acetate. The action of zinc ions in catalysing the rearrangement of dihydroindole-quinones is apparently unique, and its mechanism is discussed. H. H. H.

Chemistry of the Melanins. IV—Some Dihydroxyindoles substituted in the Benzene Nucleus. R. J. S. Beer, J. P. Brown, and A. Robertson. *J.C.S.*, 2426–2430 (Sept. 1951).

The theory recently elaborated by Bu'Lock and Harley-Mason (*J.C.S.*, 703 (1951)) of melanin formation from 5:6-dihydroxyindole by way of the corresponding

o-quinone, which is considered to undergo a self-condensation involving the 3- and the 7-positions, is stated by its authors to depend on the oxidation of a 5:6-dihydroxyindole substituted in the 7-position *not* to give a melanin. The present paper records the syntheses of 5:6-dihydroxy-7-*n*-propyl-, 5:6-dihydroxy-3-methyl-7-*n*-propyl-, 5:6-dihydroxy-4-*n* propyl, and 5:6-dihydroxy-3-methyl-4-*n*-propyl-indoles. These indoles on autoxidation in faintly alkaline solution resemble 5:6-dihydroxy-3-methyl- rather than 5:6-dihydroxy-indole. H. H. H.

Colouring Matters of the Aphididæ. V—Infra-red Spectra. A. W. Johnson, J. R. Quayle, T. S. Robinson, N. Sheppard, and A. R. Todd. *J.C.S.*, 2633–2638 (Oct. 1951).

The erythroaphins from *Aphis fabæ*, *A. sambuci*, *Eriosoma lanigerum*, and *Myzus cerasi* give identical infra-red spectra, but those from *Tuberolachnus salignus* and *Sappaphis pyri* are each different from all the others so far examined. The spectra suggest that in all the erythroaphins the hydroxyl groups are strongly bonded with the quinone carbonyl groups, i.e. occupy *peri*-positions with respect to the quinone. The infrared spectrum of diacetylerythroaphin further suggests that the quinone system in the erythroaphins is extended, i.e. that the carbonyl groups are in different rings. No frequencies corresponding to non-bonded hydroxyl or carbonyl groups are present. Pyrolysis of erythroaphin at 230°C. gives acetic acid. H. H. H.

Recent Developments in Luminescent Materials. S. T. Henderson. *Research*, **4**, 492–497 (Nov. 1951). A review with 105 references. C. O. C.

PATENTS

Diazotype Coupling Component. General Aniline. *BP* 660,534

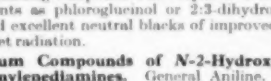
A crystalline tetrameric condensate of resorcinol or phloroglucinol with an equimolecular amount of a compound of formula R·CHO (R = hydrocarbon radical of 1–6 C) yields dark purplish-brown dyes with light-sensitive diazo components. These dyes do not offset or migrate when produced on plastic carriers, and have good fastness to water and aqueous solutions. C. O. C.

Organic Esters and Nitriles containing an Active Methylene Group as Azo Components for Diazotypes. General Aniline. *USP* 2,552,355

Compounds of formula $R^1{\cdot}CH_2{\cdot}CO{\cdot}R^2$ (R^1 = acyl, carbalkoxy, cyano, or carbiminoalkoxy Alk·O·C(:NH)–; R^2 = alkoxy, carbalkoxy, aryl, or heterocyclic radical) used as shading components in conjunction with such azo components as phloroglucinol or 2:3-dihydroxynaphthalene yield excellent neutral blacks of improved opacity to ultraviolet radiation. C. O. C.

Diazonium Compounds of *N*-2-Hydroxypropyl-*p*-phenylenediamines. General Aniline. *USP* 2,552,354

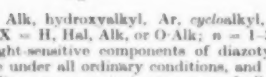
The diazonium compounds derived from compounds of formula—



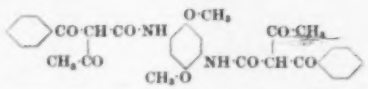
(R = H, Alk, hydroxyalkyl, Ar, *cyclo*alkyl, aralkyl, or alkaryl; X = H, Hal, Alk, or O·Alk; *n* = 1–3) are useful as the light-sensitive components of diazotypes. They are stable under all ordinary conditions, and couple with azo coupling components in presence of alkali to form fast azo dyes. C. O. C.

Acylacetarylides—Coupling Components for Azoic Dyes and Pigments. Ciba. *BP* 657,515

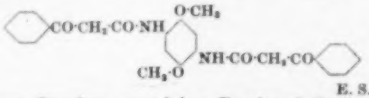
Acylacetarylides—



substantive to cellulose, and giving green–yellows to orange–reds with appropriate diazo compounds, can be made by acylation of the corresponding acetoacetarylides followed by hydrolysis of the acetyl group. Thus, 1:4-diamino-2:5-dimethoxybenzene is condensed with 2 mol. of ethyl acetoacetate, and the bisacetoacetyl compound so formed is dibenzoylated with benzoyl chloride to yield—



Hydrolysis with alcoholic HCl at 45–55°C. then gives—



E. S.

Colour Couplers containing Terphenyl Radicals. Eastman Kodak Co. *USP* 2,550,661

Compounds of formula—

(R = N or C connected to or part of a coupler molecule containing a reactive methylene or phenolic methenyl group) are photographic colour couplers. C. O. C.

2:2′-Dimethyl-4:4′-bisthiazole. General Aniline. *USP* 2,553,502

2:2′-Dimethyl-4:4′-bisthiazole is readily prepared by condensing 1 mol. of 1:4-dibromobutane-2:3-dione with 2 mol. of thioacetamide in presence of a lower alcohol. It reacts with nitrogenous heterocyclic dye salts to yield symmetrical tetranuclear dyes. C. O. C.

2-Naphthyl-J Acid as Colour Former. General Aniline. *BP* 659,128

2-Naphthyl-J acid is stable to the oxidising agents used to remove the silver image and yields dyes having greater brilliancy, stability to light, and affinity for organic fibres and gelatin than dyes derived from phenyl-J acid. C. O. C.

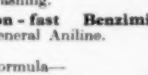
Aminonaphthols as Azo Dye Components. General Aniline. *USP* 2,551,570

Compounds of formula—

(R = H, Alk, or hydroxyalkyl; X = CO or SO_2; Y = SO_3H, SO_3H, NH_2,HCl, $N(CH_3)_2$,HCl, $NH(CH_3)$,HCl $NH(C_2H_5)$,HCl, or $N(C_2H_5)_2$,HCl) used as azo components in diazotypes have satisfactory stability and produce dyes which are fast to washing. C. O. C.

Yellow Diffusion-fast Benziminazole Colour Formers. General Aniline. *BP* 659,479 *USP* 2,547,307

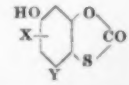
Compounds of formula—



(R^1 = a subst. or unsubst. phenyl radical a carbon atom of which is directly linked to the carbon atom of the heterocyclic ring; R^2 = –NH·CO·CH_2·A; A = alkyloyl, aroyl, cyano, or carbethoxy; R^3 = Alk of > 9 C; R^4 = a water-solubilising group; *n* = 1 or 2) are colour formers of very good solubility and yielding yellows with *p*-phenylenediamine-type developers. C. O. C.

6-Hydroxy-1:3-benzoxathiol-2-one and its Derivatives as Azo Components for Diazotypes. General Aniline. *USP* 2,547,843

Compounds of formula—

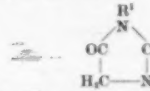


(X = H, Hal, Alk, Alk·O, SO_3H, COOH, or aminoalkyl; Y = H or Alk) are stable to precoupling and yield dyes of

high opacity to ultraviolet radiation, high colour density, and high resistance to washing, light, and offset. C. O. C.

Colour Developing with 2-Thiohydantoins or their Derivatives. DuP. *USP* 2,551,134

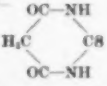
Compounds of formula—



(R^1 and R^2 = H or a hydrocarbon radical) form azomethin dyes with primary aromatic amino photographic developing agents. C. O. C.

Thiobarbituric Acid as Azo Coupling Component. General Aniline. *BP* 659,477

Thiobarbituric acid—



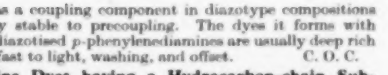
used as a coupling component in diazotype compositions is very stable to precoupling. The dyes it forms with monodiazotised *p*-phenylenediamines are usually deep rich blues fast to light, washing, and offset. C. O. C.

Cyanine Dyes having a Hydrocarbon-chain Substituent. Ilford. *BP* 660,408

meso-Substituted cyanine dyes are obtained by treating an alkyl or aralkyl quaternary salt of a benzothiazole containing a thioether grouping in the 2-position with an alkyl or aralkyl quaternary salt of a benzothiazole containing an alkyl- or aralkyl-substituted methyl group in the 2-position in presence of a strong base. C. O. C.

Filter and Antihalation Dyes. Kodak. *BP* 660,353

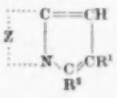
Unsymmetrical methin or polymethin oxonol dyes of formula—



(X = atoms needed to complete a nucleus of barbituric or thiobarbituric acid, *iso*oxazolone, or indanedione; n = 0, 1, or 2; Y = atoms to complete a pyrazolone nucleus) are useful filter and antihalation dyes. C. O. C.

Pyrrocolinocarbocyanine Dyes. Kodak. *BP* 658,560

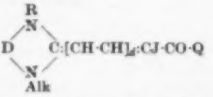
A 1:3:3-trialkoxypropene is condensed in presence of an anhydrous carboxylic acid and a metal salt of a stronger acid with a compound of formula—



(R^1 and R^2 = H, Alk, or Ar; Z = atoms to complete a heterocyclic nucleus of the pyridine series). Dyes from 2:3-diarylpyrrocolines are faster to light than those from 2:3-dialkylpyrrocolines. C. O. C.

***mero*Cyanine Dyes containing a Benziminazole Nucleus.** Eastman Kodak Co. *USP* 2,548,571

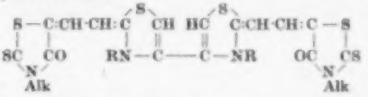
Solutions of dyes of formula—



(R = Alk or Ar; D = a bivalent *o*-arylene radical; J = cyano, carboxyl, carbalkoxyl, acyl, carbamyl, or a heterocyclic nucleus of the quinoline series; Q = OH, Alk, Ar, a subst. or unsubst. amino, carbalkoxyl, alkoxyl, or a heterocyclic nucleus of the benzofuryl series; or J and Q together = atoms necessary to complete a 5- or 6-membered heterocyclic nucleus or a 5-membered carbocyclic nucleus; d = 1–3) shift their light absorption to markedly shorter wavelengths with increasing polarity of the solvent. C. O. C.

Tetranuclear *mero*Cyanine Sensitising Dyes from Bisthiazoles. General Aniline. *USP* 2,553,503

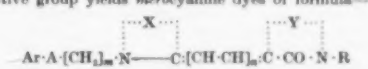
Dyes of formula—



(R = Alk or aralkyl) are obtained by heating, with or without a tertiary base, an alcoholic solution of 1 mol. of a diquaternary *cyclo*ammonium salt of 2:2′-dimethyl-4:4′-bisthiazole and 2 mol. of a rhodanine intermediate having a reactive acetanilido group linked to a monomethin chain adjacent to a keto group, e.g. 5-acetanilidomethylene-3-methylrhodanine. C. O. C.

***mero*Cyanine Dyes containing an *N*-Aryloxy-, *N*-Arylthio-, or *N*-Arylseleno-alkyl Group.** General Aniline. *USP* 2,553,494

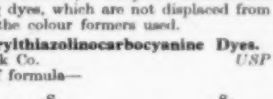
Condensing an *N*-aryloxyalkyl, *N*-arylthioalkyl, or *N*-arylselenoalkyl heterocyclic dye salt having a reactive methyl group in α- or γ-position to the N atom with a 5- or 6-membered ketoheterocyclic compound containing a reactive group yields *mero*cyanine dyes of formula—



(A = O, S, or Se; m = 2 or 3; n = 0, 1, or 2; R = Alk or Ar; X and Y = atoms to complete a 5- or 6-membered heterocyclic nucleus). They are used as non-dispersing sensitising dyes, which are not displaced from the emulsions by the colour formers used. C. O. C.

***NN*′-Diarylthiazolinocarbocyanine Dyes.** Eastman Kodak Co. *USP* 2,552,252

Dyes of formula—



(R^1 = subst. or unsubst. Ar; R^2 = H or Alk; X = anion) are non-diffusing photographic sensitisers. C. O. C.

Modifying the Colour of Quinoneimine or Azomethin Dyes. DuP. *USP* 2,551,091

The colour of a quinoneimine or azomethin dye formed by colour-coupling development of a colloidal silver halide emulsion layer can be modified by treating a layer containing a carboxyamide or sulphonamide group having an N atom attached to the amino N atom after exposure and before, during, or after development with a dilute aqueous solution of a surface-active quaternary ammonium salt having a C_{8-22} Alk attached to the quinquevalent N. C. O. C.

Dispersible Dye Powders. General Aniline. *BP* 660,137

A water-insoluble dye is kneaded with aqueous secondary liquorice extract until reduced to the colloidal state, and is dried during or after kneading. The product is readily dispersible in water to yield a colloidal dispersion which is stable at temperatures up to the boil. C. O. C.

Carbon Black. Godfrey L. Cabot. *USP* 2,553,199

Improvement on *USP* 2,462,026 whereby the yield is increased by 3–4 lb. per gallon of oil consumed. C. O. C.

Furnace Black. United Carbon Co. (Maryland). *BP* 661,057

Production of a black having many of the characteristics of an impingement-type carbon black is described. C. O. C.

Pelleting Carbon Black. Columbian Carbon Co. *USP* 2,550,802

Titanium Dioxide Pigments extended with Calcium Sulphate. DuP. *USP* 2,549,261

A pigment which yields coating compositions which do not thicken in humid atmospheres is produced by precipitating $CaSO_4$ as small gypsum crystals, which are then heated to convert them to a porous anhydrite product of increased surface area, then blending with TiO_2 of fully

developed pigment properties, and finally grinding first in a pressure pulverising mill and then in a fluid-energy mill. C. O. C.

Lead Antimonate — Lemon-yellow Ceramic Pigments. Harshaw Chemical Co. *USP* 2,552,795

Improving the Fastness of Direct Dyeings—Pigments—Animalising Cellulosic Fibres (III p. 29).
4-Hydroxy-2-alkylbenziminazoles as Azo Coupling Components in Diazotypes (IX p. 41).
Recovering Fats, Dyes, and Leather Extract from Scrap Leather (XII p. 45).
Galenical Examination of Frangula Bark (XIV p. 47).

V—PAINTS; ENAMELS; INKS

Photochemical Decolorisation of Mixtures of Berlin Blue and Zinc White. R. Haug. *Farbe u. Lack*, **57**, 292–294 (1951): *Chem. Abs.*, **45**, 8360 (10 Oct. 1951).

Milori Blue (I) was decomposed in alkaline aqueous buffer solutions > pH 7–9, depending on the grade, while 9 : 1 mixtures of Zinc White (II) and I were stable up to pH 12. $Zn_2[Fe(CN_6)]$ (III) was also decomposed at pH 13. Exposure to light of the I–II mixtures suspended in buffered alkaline solutions covered with mineral oil to exclude O_2 caused decolorisation, particularly at pH 9–12, but all turned blue again when H_2O_2 was added. In slightly acid solutions containing 1, 2, 5, 10, and 20% $ZnSO_4.7H_2O$ or $Zn(NO_3)_2.6H_2O$, the I–II mixtures were also decolorised by light, but it took longer with the 20% Zn salt concentration. Mixtures of 1–2% I with various white pigments were similarly exposed to light—distinct decolorisation occurred with grades of II (25, W8), of TiO_2 (Standard A, E), and more slowly with lithopone (Red Seal), but none with other grades of TiO_2 and with Lithodur. No decolorisation occurred with inerts, but a yellow discoloration of the supernatant liquid (indicating hydrolysis to soluble ferrocyanides) occurred even in the dark with barytes, blanc fixe, Lenzin, various chalks, kaolin, and talc. Addition of III to I–II mixtures inhibited decolorisation (e.g. 1 part of I, 5 of II, and 4 of III form a stable mixture), but TiO_2 in place of III had no such effect. C. O. C.

PATENTS

Printing Inks. Contes Brothers & Co. *BP* 660,284

A moisture-setting printing ink which gives prints resistant to alkali and has high press stability, particularly when pigmented with compounds of tungstic, phosphoric, or molybdic acid with basic dyes, compriaes a brittle non-sticky alkyd resin dissolved in a water-miscible glycol from which it is readily precipitated by addition of water. The resin is formed from a mixture of > 50% of phthalic and/or a saturated aliphatic dicarboxylic acid of 4–6 C and < 50% of an $\alpha\beta$-unsaturated dicarboxylic acid of < 7 C and one or more polyhydric alcohols. C. O. C.

Coating and Adhesive Compositions containing Methyl-substituted Polysiloxanes. British Thomson-Houston Co. *BP* 658,640

An adhesive and coating composition is made by (1) heating a mixture of (*a*) a liquid polymeric dimethylsiloxane containing up to 2 mol. % of copolymerised monomethylsiloxane and (*b*) an iron halide until the thickening mass has just passed from the stringy stage to that wherein a sample drop, when pulled off, fails to string but snaps back instead; and (2) adding to this molten mass a finely divided, water-insoluble, wholly inorganic metallic oxide or salt pigment. J. W. B.

Silver Paint. Erie Resistor Corpn. *USP* 2,550,845

A paint yielding a film of good electrical conductivity before drying and reducible by firing after drying to a metallic silver film consists of silver oxide dispersed in an aqueous solution of a protective colloid, e.g. polyvinyl alcohol. C. O. C.

Coatings of Zinc Dust–Alkali Silicate Type. Industrial Metal Protectives. *BP* 658,423

Zinc dust–alkali silicate coating compositions are stable for prolonged periods if the zinc particles have been coated with a substance unaffected by the alkali silicate, e.g. a wax, unsaponifiable fat, or synthetic resin. C. O. C.

Wrinkle Finishes (III p. 30).
Oil-modified Epoxide Resins (XIII p. 45).

VI—FIBRES; YARNS; FABRICS

Fibres. C. S. Grove, J. L. Vodonik, and R. S. Casey. *Ind. Eng. Chem.*, **43**, 2235–2238 (Oct. 1951).

A review of the production and uses of synthetic fibres since 1937. A. J.

Contradictory Data on Spiral Structures in the Secondary Cell Wall of Fibres of Flax, Hemp, and Ramie. P. A. Roelofsen. *Text. Research J.*, **21**, 412–418 (June 1951).

As the data given in the literature on the spiral structures in fibres of flax, hemp, and ramie do not agree, these fibres were reinvestigated microscopically after swelling in cuprammonium. This revealed that in flax there are three layers with different spiral structures, one of which is usually not visible, explaining the previous contradictory results. In ramie and hemp a third, innermost layer has not so far been found. A. B.

Degree of Disintegration of Bast Fibres. F. Tobler. *Melliand Textilber.*, **32**, 575–577 (Aug. 1951).

The effects of various factors on the flax-retting process are discussed. Photomicrographs are given showing the disposition of the fibres of Mapun flax at various stages of retting, the process being continued to give considerable overtreatment. They show also the accelerated disintegration caused by renewing the retting water after a few hours. The variation in the degree of retting throughout the length of the stalk is illustrated; at the base, and particularly at the tip, the degree of disintegration is low, and it is recommended that the middle should be used for control tests. Other photomicrographs illustrate differences due to the variety of the plant and to the conditions of growth. The effects of chemical methods of retting and of the use of horse-chestnut flour in after-retting are also examined. A. E. S.

Effect of Ultrasonics on Rate of Coagulation of Cellulosic Solutions (Viscose). V. Tomberg. *Nature*, **168**, 292–293 (18 Aug. 1951).

By adding dilute spinning-bath solution, drop by drop, to dilute (1 : 4) viscose solution until the reaction just begins, the coagulation and regeneration rate is slowed down and can be followed spectrometrically. The influence of ultrasonic radiation of various frequencies and power inputs is studied. There are no remarkable differences due to change of frequency (800–3200 kilocycles/sec.), but for inputs of 15–50 watts total acoustic energy, the initial rates are 2–3 times greater; the final state is hardly changed. L. P.

Some Tensile Properties of Wool in Solutions containing Salt and Acid. H. Bogaty, A. M. Sookne, and M. Harris. *Text. Research J.*, **21**, 479–481 (July 1951).

Some unusual tensile and retractile phenomena in solutions containing salt and acid are reported. Wool fibres extended while immersed in conc. neutral salt solutions exhibit the properties of dry fibres, showing large hysteresis loss and incomplete immediate recovery of length. The addition of small amounts of acid to the salt causes an even larger hysteresis loss. Elevation of temperature causes improved recovery of work for extension and recovery of length in the case of wool in HCl–KCl mixtures, owing to increased mobility of the molecular segments. A. B.

Formation of Silk Fibre by the Silkworm. E. H. Mercer. *Nature*, **168**, 792–793 (3 Nov. 1951).

Changes occurring in the soluble precursor of fibroin ("fibroinogen") are studied, and observations by Kratky *et al.* (*Nature*, **165**, 319, 527 (1950)) are confirmed. Fibroinogen extracted from the silk gland by water gives a turbid soln., which becomes more turbid on standing, with the formation of a fibrous ppt. giving an X-ray pattern similar to that for ground silk fibre. Electron-micrographs of the freshly prepared extract show no significant structure, whilst the aged extract shows fine fibrils of ca. 500 A. diameter and up to 3500 A. in length. Similar, but longer, fibrils are obtained with silk fibre disintegrated with trypsin. The spontaneous appearance of fibrils from fibroinogen may be due to unsymmetrical aggregation of soluble protein molecules without unfolding (linear aggregation), and this may be a characteristic step in fibre formation. Such aggregation may be initiated by colloidal forces, which are followed by orientation into

fibrils by short-range forces and mechanical orientation of fibres during spinning. A. J.

Amino Acids of Silk Sericin. J. T. B. Shaw and S. G. Smith. *Nature*, **168**, 745 (27 Oct. 1951).

Silk sericin is divided into three layers of varying solubility in hot water, dilute acid, or alkali. Each layer is hydrolysed with HCl, and the resulting amino acids are separated by partition chromatography. Fifteen amino acids are identified, of which valine has not been previously reported in sericin, and the presence of lysine, proline, glycine, and phenylalanine is confirmed. Proline occurs only in the inner sericin layer, and tryptophan only in the inner and centre layers. A further basic amino acid, which is not histidine but may be hydroxylysine, may be present in each layer. A. J.

Structures of Fibrous Proteins— I. Y. Kanda. *Chem. Researches* (Japan), **9**, 133–157 (1951): *Chem. Abs.*, **45**, 7610 (10 Sept. 1951).

Shimanouchi and Migushima's and Huggins' (*Chem. Abs.*, **43**, 8843; **37**, 4292) theories on the structure of polypeptides are criticised, and new structures proposed for fibrous proteins. The α-amino acids are classified into three groups— $^{+}NH_3{\cdot}CH_2{\cdot}COO^{-}$, $^{+}NH_2{\cdot}CHR{\cdot}COO^{-}$, and those in which R is long and forms a bond with N to close a 5-membered ring. A suggested structure for α-keratin which can be constructed only from L-amino acids is proposed, and the existence of CH–N hydrogen bonds in the polypeptide main chain postulated. Stretching the polypeptide chain of α-keratin enables a new polypeptide structure for feather and β-keratin to be advanced. New structures for silk fibroins from various species of silkworms are formulated by combining alternately the amino residues of polyglycine and those of α-keratin, feather keratin, and β-keratin. C. O. C.

Recent Developments in X-Ray Diffraction Studies of High Polymers. C. W. Bunn. *J. Appl. Chem.*, **1**, 266–268 (June 1951).

Both fully drawn and disoriented fibres show a tilt in definite crystallographic directions. X-Ray diffraction photographs show this, and give valuable aid in the determination of the crystal structures of high polymers. Nylon 66, caprolactam, polythene, and Terylene are examined, and the ability of high polymers to crystallise is said to depend on geometrical regularity of molecular structure. The X-ray diffraction method for determining the proportions of crystalline and amorphous material in polymer specimens is discussed. A new phenomenon has been observed in the onset of partial disorder in polytetrafluoroethylene at a temperature of 300°C. below the melting point. A. B.

Optical Rotation and Chain Folding in Synthetic Polypeptides and Gelatin. C. Robinson and M. J. Bott. *Nature*, **168**, 325–326 (25 Aug. 1951).

The specific rotation of *m*-cresol solutions of a synthetic polypeptide (γ-methyl L-glutamate–DL-phenylalanine copolymer) of increasing molecular weight, and the CO-stretching frequency of films prepared by evaporating the solutions, are found to be related. The influence of chain folding on optical activity is discussed. An aqueous solution (pH 6·8) of gelatin (5%) at 40°C. had practically the same specific rotation (— 128°) as the film prepared by evaporating the hot solution; whereas, at room temperature, a similar solution had a rotation (— 262°) much smaller than that of the film formed on evaporating the cold solution (— 1000°). The configuration of the molecular chains taken up at low temperatures is considered to be an inter-chain H-bonded form, whilst that at temperatures above 35°C. is an intra-chain H-bonded α-form. That LiBr, LiI, or LiCNS reduces the rotation to very near that of the hot solution and also prevents gel formation is regarded as a similar effect to the conversion of silk by LiBr from the inter-chain H-bonded β-form to the water-soluble α-form. L. P.

Structure of Synthetic Polypeptides and Proteins. C. H. Bamford and W. E. Hanby. *Nature*, **168**, 340–341 (25 Aug. 1951).

The helical structure for synthetic polypeptides and proteins recently proposed by Pauling, Corey, and Branson is rejected on the ground that, in the X-ray photographs, the observed angle subtended by the polar arcs (10–11° for synthetic polypeptides, 15° for porcupine quill) is inconsistent with the angle of 24·5° predicted by such a structure. L. P.

(I) Configuration of Polypeptide Chains; (II) Polypeptide Chains in Muscle. L. Pauling and R. B. Corey. *Nature*, **168**, 550–551 (29 Sept. 1951).

I— Reply to a paper by M. F. Perutz (*Nature*, **167**, 1053 (1951)). Arguments are advanced on the importance of the 1·5 A. reflection in proving the existence of a 3·7-residue α-helix.

II— It is suggested that the protein which makes the greatest contribution to the X-ray diffraction pattern is not the one which undergoes significant structural change during contraction. Structural units may be of α-keratin but connected to each other by pleated sheets of contractile protein which are far enough separated by solution not to give a β-keratin pattern. Contraction of the pleated structure then gives a well oriented α-helix, and the non-contractile α-keratin becomes disoriented. J. W. B.

1·5-A. Reflection from Proteins and Polypeptides. M. F. Perutz. *Nature*, **168**, 653–654 (13 Oct. 1951).

A reply to criticisms by Pauling and Corey (above). J. W. B.

Mechanism of the Degradation of Polyamides. B. G. Achhammer, F. W. Reinhart, and G. M. Kline. *J. Appl. Chem.*, **1**, 301–320 (July 1951).

Films of copolymers of nylon salts with ε-caprolactam were exposed to heat, ultraviolet radiation, and different atmospheric conditions. Changes in chemical and physical structure of the polymer were determined by— infrared absorption, ultraviolet absorption, viscosity of solutions, dielectric constant and dissipation factor, photomicrography, X-ray diffraction, electron microscopy, effect of organic liquids, pyrolysis studies, and physical properties. It is concluded that degradation of polyamides may involve (1) change in chemical structure, (2) change in crystallinity, and (3) change in the amount of molecularly associated materials such as water and ethanol. The relation between stability and chemical constitution is discussed, and suggestions are made for improving the service life of polyamides. A. B.

Pore-size Distribution in a Selected Series of Closely Woven Fabrics. E. Honold and E. L. Skau. *Text. Research J.*, **21**, 419–427 (June 1951).

The mercury-intrusion method for the determination of pore-size distribution is applied to eighteen closely woven cotton fabrics. Mature cotton gives fabrics with a much larger proportion of their total void volume in the surface depressions and a much smaller proportion in the interfibre pore spaces. A shift of the peak in the distribution curve to smaller pores is observed as the pickage is increased. Scouring results in a loss of total void volume. A correlation is shown between air permeability and the void volume of the interfibre region. A. B.

PATENTS

Zein Fibres. Corn Products Refining Co. *USP* 2,552,079

An aqueous alkaline dispersion or solution of zein is coagulated in an aqueous alkaline saline coagulating bath, and then without precuring is oriented and stretched in a more concentrated alkaline saline bath. C. O. C.

Fluorinated Polyamides. American Viscose Corpn. *BP* 660,111

Inherently flameproof fibre-forming polyamides are obtained by heating a dicarboxylic acid derivative of formula $Y{\cdot}[CX^1_2]_n{\cdot}Y$ (X = H or F, Y = COCl or COOR, R = lower Alk, and n = 1–5) with a diamine of formula $H_2N{\cdot}CH_2{\cdot}[CX^2_2]_m{\cdot}CH_2{\cdot}NH_2$ (m = 0–4, X^2 = H or F), the monomers being selected so that X^1 and/or X^2 = F, and when m = 0 then X^1 = F, e.g. diethyl hexafluoroglutarate and hexamethylenediamine. W. G. C.

Acrylonitrile–*iso*Butylene Copolymer soluble in a Mixture of Nitromethane and Formaldehyde. American Viscose Corpn. *USP* 2,549,913

A copolymer of 90 ± 0·5 mol. % acrylonitrile and 10 ± 0·5 mol. % *iso*butene is soluble in a mixture of nitromethane and formamide to a clear homogeneous solution which is indefinitely stable at room temperature. Such solutions can be used for producing yarns which are equal to 100% polyacrylonitrile yarns in physical properties and

which give deep dyeings with disperse acetate rayon dyes. C. O. C.

Photochemical and Thermal Effects on Fibres and Dyes (VIII p. 39).
Impregnation of Fabrics with Aqueous Dispersions of Hydrophobic Substances. II— Determination of the Heterocapillarity of Closely Woven Fabrics (X p. 42).
Effect of Tension on Water Absorption by Hair (XII p. 44).
Identification of Textile Materials (XIV p. 47).

VII— DESIZING; SCOURING; CARBONISING; BLEACHING

Correct Temperature for Enzymatic Desizing. J. Voss. *Melliand Textilber.*, **32**, 621–622 (Aug. 1951).

The course of the decomp. of starch in soln. (pH ~ 7) by an amylase (bacterial, malt, or pancreatic) is examined at 30, 40, and 50°c., the incompletely degraded starch remaining at any time being estimated by weighing the ppt. formed on adding methanol to a test sample. The rate of decomp. increases with rise of temp., the temperature dependence being greatest for malt amylases and least for bacterial amylases. In all cases the increase in rate in the interval 30–40°c. is very much greater than in the interval 40–50°c. It is concluded that in enzymatic desizing the temp. should not be allowed to fall below 40°c. It is stated that at lower temperatures retrograde products are formed that are not readily attacked further by enzymes. A. E. S.

Hydrolysis of Wool Wax and Related Esters of High Molecular Weight. I— Homogeneous Reactions. E. V. Truter. *J. Appl. Chem.*, **1**, 452–453 (Oct. 1951).

The homogeneous alkaline hydrolysis of the acetates, octoates, and palmitates of n-octadecanol and cholesterol in the four lowest normal alcohols has been studied. It is shown that the various reaction constants are within the range recorded for similar reactions of low-mol.wt. esters, no anomalies being observed. It is concluded that the difficulties encountered in the heterogeneous saponification of wool wax must be due to surface phenomena.

II — Heterogeneous Reaction — Oil-in-water Emulsions. Idem. *Ibid.*, **1**, 454–456 (Oct. 1951).

The aqueous alkaline hydrolysis of wool wax, n-octadecyl octoate and palmitate, and cholesteryl acetate and octoate as oil-in-water emulsions stabilised by various agents has been examined. It is shown that the extent of reaction in a given time is not related to the quality of the emulsion, but is probably limited by the rate of penetration of the interface. When about one-third of the wax has been saponified, the rate of reaction is considerably reduced, because the liberated alcohols compete with the esters for places in the interface, and the latter are excluded by a mass action effect. Complete saponification as an oil-in-water emulsion will be possible only if these alcohols can be removed from the interface. W. K. R.

Sorption of Synthetic Surface-active Compounds by Carbon Black. G. R. F. Rose, A. S. Weatherburn, and C. H. Bayley. *Text. Research J.*, **21**, 427–432 (June 1951).

The sorption from aqueous solutions on to carbon black of a series of sodium alkyl sulphates and a number of compounds extracted from commercially available surface-active agents of various types is measured. The sorption does not conform with the Freundlich adsorption isotherm over the entire concentration range covered, but shows a change in slope at values corresponding approximately to the critical micelle concentrations. The anionic and cationic compounds examined show remarkably similar sorption characteristics. A. B.

Removal of Impurities from Grey Cotton. I—A Review of Developments in Plant for Alkali Boiling. O.-J. Hvattum and H. A. Turner. J.S.D.C., **67**, 416–424 (Nov. 1951). **II—Experiments with an Alkali Pad-Steaming Sequence.** O.-J. Hvattum and H. A. Turner. *Ibid.*, 425–434 (Nov. 1951).

Alkali-boiling of Cotton Goods. V. E. Rostovtsev. *J. Appl. Chem. (U.S.S.R.)*, **24**, 976–980 (Sept. 1951).

A review is given of the conflicting theories regarding the nature of the changes in the cotton fibre that are responsible for the development of capillarity properties in cotton materials that have been subjected to an alkali boil. The view, at one time generally accepted, that the essential process in the development of hydrophilic properties is the removal of cotton wax, which in the alkali boil is effected by an emulsification process, has met with objections based mainly on the non-absorbency of cotton material that has been thoroughly extracted with fat-solvents. The protagonist in this attack, Viktorov, considers that the essential process is the removal of pectins from the secondary layers of the fibre and the formation, in their stead, of an interconnected system of fine spaces through which the capillary rise of water can occur. However, Viktorov's rejection of the emulsification theory of boiling rests on the assumption that solvent-extracted cotton is indeed free from wax. A number of workers have shown this to be untrue. Some experiments have now been done in an attempt to clarify the situation. Cotton yarn was extracted in a Soxhlet with a number of solvents, used successively, e.g. with light petroleum, benzene, toluene, xylene, isoamyl alcohol, and finally CCl_4. After this severe extraction process, the yarn was still substantially non-absorbent. The total extract was 0·84% on the dry wt. of the yarn, but the decrease in the wt. of the yarn itself was only 0·36%. The extract obtained with benzene alone was 0·55%, and the wt. of the yarn decreased by the same amount. From this and other results it is concluded that when cellulose is continuously extracted with high-boiling solvents, extraneous changes occur that lead to an increase in its wt. and possibly also to an increase in its content of solvent-extractable material. It is asserted that the true wax content of cotton remains unknown: only solvent-extraction methods have been used for its measurement, and in these, either the extraction is incomplete, or the results are distorted by the occurrence of extraneous processes during the extraction. The difficulty of removing wax is attributed to its complex composition and to the inaccessibility of its separate particles, which, in its turn, is related to the complex structure of the primary wall. Further experiments were done in order to test the effect of the state of the primary wall on the hydrophilic properties of the fibre. Cotton fibres were pressed lightly against the surface of a rotating ground glass joint, a treatment that was considered to produce a certain amount of damage in the primary wall, but to be very far from effecting its complete removal. The average contact angle of wetting was 59·7° for the abraded fibres, whereas the value for untreated fibres was 132°. In a further experiment it was shown that, contrary to Viktorov's postulate, there is no measurable capillary rise of suitably coloured water in a single fibre taken from well boiled, absorbent cotton material, whereas in a bundle of such fibres the rise is too rapid to be followed under the microscope. It is concluded that the capillarity properties of cotton goods are determined entirely by the state of the primary wall of the fibre and that the essential process occurring in the boiling of cotton is not the simple removal of the fat and wax impurities by an emulsification process, but the partial disruption of the primary wall, leading to an interconnected system of hydrophilic regions on the surface of the fibre. A. E. S.

Continuous Stripping of Carpet-yarn Waste. P. J. Wood and E. T. Duffy. *Amer. Dyestuff Rep.*, **40**, P 675–P 680 (15 Oct. 1951).

Carpet-yarn waste is effectively stripped by treating in (1) 4% (on wt. of fibre) of soda ash at 50°c. for 30 min. and rinsing, followed by (2) 56% (on wt. of fibre) of 3% acetic acid at 50°c., during which bath 3% of zinc formaldehyde-sulphoxylate is added and the bath boiled for 30 min. On the commercial scale a five-bowl scouring machine may be successfully employed, using soda ash in the first bowl and acid-reducing agent in the next three. J. W. B.

PATENTS

Wool Scouring. Mathieson Chemical Corpn. *USP* 2,552,944

Optimum scouring is obtained in the conventional soap–soda scour when the apparent carbonate : bicarbonate ratio of the bath is maintained at 1 : 0·5–2 by adding a predetermined quantity of a hydroxide of an alkali metal or alkaline earth metal. C. O. C.

Stripping Dyed Wool. Fabric Research Laboratories. *USP* 2,549,099

The material is treated with a solution containing V, Ti, or Cr ions in a low valency state, some of the ions being preferably in their lowest valency state and their concentration being continuously maintained during the treatment by electrolysis of the solution. Stripping is due to the reducing action of the solution, the reducing power of which is maintained constant by the electrolytic treatment. The handle and the strength of the wool are only slightly if at all affected, and the process strips many dyes which it has hitherto been impossible or extremely difficult to remove. C. O. C.

VIII—DYEING

Theory of Dyeing. III—Acid Strength of Acid and Direct Dyes. E. Elöd and H. G. Frohlich. *Melliand Textilber.*, **32**, 622–626 (Aug. 1951).

A review is given of methods of determining the strengths of dye-acids. Methods of preparing pure dye-acids are described. A number of acid and direct dyes are converted into pure dye-acids, and it is shown how various methods based on pH determinations (potentiometric titration, variation of pH with concn., differential titration in presence of acids of known strength) enable them to be sorted according to strength. The dissociation constants of the dye-acids, determined from the pH of a 0·01 N. soln., lie between 10^{-1} and 10^{-3} for most of the acid dyes examined, and between 10^{-2} and 10^{-3} for direct dyes and some acid dyes containing basic groups. A comparison of the dissociation constants of the acid dyes with the fastness to water of their dyeings on wool indicates that the strength of the dye-acid is an important factor in determining wet-fastness, which is greater for dyes of lower dissociation const. A. E. S.

Talking of Dyeing. R. A. Peel. *J.S.D.C.*, **67**, 447–448 (Nov. 1951).

Natural Dyes used in Sweden from the Iron Age to the Introduction of Synthetic Dyes derived from Coal Tar. I—Henschen. *Ciba Review*, (88), 3189–3190 (Oct. 1951).

The Prospect Before Us [The Future of Dyeing]. J. G. Evans. *J.S.D.C.*, **67**, 631–635 (Dec. 1951).

Photochemical and Thermal Effects on Fibres and Dyes. A. Schaeffer. *Melliand Textilber.*, **32**, 671–620 (Aug. 1951).

Dyeings on wool, cotton, viscose rayon, and acetate rayon were exposed to light during May-August. The exposures were done in four boxes, differing in size and in the means provided for mounting the samples and for ventilation; one was provided with a conditioned atmosphere. The conditions near the samples were found to vary progressively from box 1 (20–49°c., 14–58% R.H.) to box 4 (20–26°c., 54–73% R.H. (conditioned atmosphere)). The light-fastness standards of the Deutsche Echtheitskommission faded most rapidly in box 1 and least rapidly in box 4. Most of the dyeings behaved like the standards, so that their ratings were almost unaffected by the variations in conditions. However, two afterchrome dyes on wool and nine vat dyes on cotton or viscose rayon showed the reverse behaviour, fading most rapidly in box 4. White and vat-dyed yarns were tested also for change in tensile strength during exposure. The % loss in strength always increased from box 4 to box 1 and, except in box 4, the relative behaviour of the different samples depended on the length of exposure. The additional loss in strength in boxes 1, 2, and 3 is regarded as a thermal effect, the loss that occurs in the conditioned atmosphere of box 4 being treated as purely photochemical. It is shown that by neglecting the effect of thermal action during exposure, incorrect inferences may be made concerning the magnitude, or even existence, of tendering action in a dye. It is recommended that all light exposures should be done in large boxes provided with air circulation and, preferably, conditioning equipment. The thermal insulation of the samples should be as low as possible. A. E. S.

Application of Sonic and Ultrasonic Waves in Dyeing. M. Bräuer. *Melliand Textilber.*, **32**, 701–707 (Sept. 1951).

The application of sonic and ultrasonic waves has been suggested for scouring, desizing, speeding up washing-off after dyeing, soaping of dyeings, accelerating the dyeing of cotton and wool, dyeing of hydrophobic fibres such as Orlon, and rendering wool shrink-resistant. In dyeing experiments on the whole the rate of absorption of the dye was increased, ultrasonic waves being somewhat more effective than sonic radiation. Increase in frequency showed little effect with cotton, but noticeable effect with wool, silk, and Perlon. Ultrasonic but not sonic waves resulted in complete penetration of difficult materials. Dyeing time can be reduced, and fibre degradation was observed in only one instance. It is essential to keep the material in open width and free from folds during treatment. The use of sonic and ultrasonic waves would appear to represent a means of speeding up production, but is not universally applicable, as specially constructed machines are necessary. Suitable machines are stated to have been constructed in U.S.A. B. K.

Developments in the Azoic Dyeing of Yarns. W. Thornber. *J.S.D.C.*, **67**, 502–507 (Dec. 1951).

Developments in the Application of Sulphur Dyes to Loose Cotton and Yarns. H. Birchall. *J.S.D.C.*, **67**, 495–501 (Dec. 1951).

Progress of Package Dyeing with Vat Dyes and Indigosols. F. Smith. *J.S.D.C.*, **67**, 514–521 (Dec. 1951).

Tendering during Dyeing—Oxidative Tendering of the Fibre in Vat Dyeing and its Prevention. W. Schönberger. *Melliand Textilber.*, **32**, 630–634 (Aug. 1951).

Tendering of the fibre occurs when cellulosic material is dyed with vat dyes in machines, such as winch becks, that permit ready access of air to the material during dyeing. The effect is considered to be due to the formation of an active, fibre-tendering peroxide by the action of oxygen on the leuco dye. Strips of cotton and rayon fabrics are dyed with various vat dyes in small winch becks under conditions that are particularly favourable to tendering (3-hr. dyeing, considerable exposure to air). The tensile strength (wet and dry) of the material is determined before and after dyeing. Viscose and cuprammonium rayons are tendered to a much greater extent than cotton, which is to be partly explained by the greater accessibility of the fibres to the air resulting from the lighter construction of the fabrics. The degree of tendering varies with the dye; almost all vat dyes that contain an oxazole or thiazole ring are powerful tenderers. It is found that the addition to the dyebath of certain substances, particularly polyhydroxy compounds, greatly reduces the tendering. A very high degree of protection is obtained with ~0·4 g. per litre of tannic acid, protocatechuic acid, or Brenzöl, a cheap commercial mixture of polyphenols. This is confirmed under practical dyeing conditions using Indanthren Red FBB on viscose rayon in a winch beck in presence and in absence of 0·4 g./litre of Brenzöl. It is considered that the fibre-tendering peroxide reacts with the polyhydroxy cpd. rather than with the fibre, and that the agent is regenerated when the fabric re-enters the dyebath. A. E. S.

Developments in the Dyeing of Piece Goods with Vat Dyes. D. Haworth and W. Kilby. *J.S.D.C.*, **67**, 508–513 (Dec. 1951).

Practical Survey of Hosiery Dyeing. W. A. Edwards. *J.S.D.C.*, **67**, 539–545 (Dec. 1951).

Modern Piece-dyeing Methods. O. Ziegler. *Melliand Textilber.*, **32**, 626–629 (Aug. 1951).

A review of continuous dyeing methods developed in the U.S.A. and in Britain. A. E. S.

Application of Direct Dyes to Viscose Rayon Yarn and Staple. J. Boulton. *J.S.D.C.*, **67**, 522–538 (Dec. 1951).

Rayon Staple—A Dyeing Miscellany. J. Boulton. *J.S.D.C.*, **67**, 401–415 (Nov. 1951).

Evolution of Slubbing Dyeing and Dyes. J. F. Gaunt. *J.S.D.C.*, **67**, 570–578 (Dec. 1951).

Evolution and Development of Dyeing within the Carpet Industry. G. Robinson and D. Jagger. *J.S.D.C.*, **67**, 557–569 (Dec. 1951).

Developments in the Application of Dyes to Cellulose Acetate Rayon. A. Mellor and H. C. Olpin. *J.S.D.C.*, **67**, 620–630 (Dec. 1951).

Yarn Producer's Problems in the Dyeing of Nylon. H. J. Palmer. *J.S.D.C.*, **67**, 609–619 (Dec. 1951).

Dyeing of Unions of Perlon with Cuprama, Viscose Staple Fibre, and Cotton. J. Neubert. *Melliand Textilber.*, **32**, 708–713 (Sept. 1951).

A one-bath process is recommended for the dyeing of unions of Perlon L staple with Cuprama, viscose staple, or cotton. Direct dyes which dye both the Perlon and the cellulosic fibre solid from a neutral bath may be used, or alternatively a one-bath process employing direct dyes for the cellulosic fibre which show maximum reservation of the Perlon along with neutral-dyeing wool dyes for the latter fibre. Fastness to washing is improved by after-treating the direct dyes with Levogen WW; by the use of selected developed dyes which give solidity of the two types of fibre, but the diazotisation treatment must be increased in intensity on account of the Perlon; Benzo Fast Copper dyes in combination with neutral-dyeing Telon Fast dyes for the Perlon, selecting such products as are resistant to copper; and vat dyes applied by pigment dyeing and pigment padding techniques. B. K.

Dyeing of Synthetic Fibres. P. J. Choquette. *Amer. Dyestuff Rep.*, **40**, P 681–P 684 (15 Oct. 1951).

Application of vat dyes and leuco esters of vat dyes to Orlon and Terylene piece goods, and the use of high temp. and carriers in the package dyeing of these fibres, are outlined and explained. Methods for dyeing Vicara, dynel, and Fortisan are given, and future trends in machinery development discussed. J. W. B.

High-temperature Dyeing of New Synthetic Fibres. C. G. Lyle, J. J. Iannarone, and R. J. Thomas. *Amer. Dyestuff Rep.*, **40**, P 586–P 596 (17 Sept. 1951).

Continuous-filament Orlon acrylic fibre has relatively poor dye affinity at 200–212°F., but may be successfully dyed with disperse acetate rayon dyes and basic dyes at 250°F. Careful buffering with $NaHCO_3$ enables selected indigoid and thioindigoid dyes to be applied without damage to the fibre. The cuprous ion method of applying acid dyes to fibres containing nitrile groups is adaptable at 250°F. Filament and staple yarns of Terylene polyester are relatively more easily dyed at 212°F., particularly using a carrier, which may, however, be dispensed with when dyeing disperse dyes by the high-temperature method. J. W. B.

PATENTS

Dyeing with Vat Dyes which tend to Over-reduce at High Temperatures. American Cyanamid Co. *USP* 2,548,543–4

Addition of at least 25% on the weight of the dye of an inorganic nitrite or halogenate avoids over-reduction at high temperatures and results in dyeings of greater strength and brightness. C. O. C.

Dyeing with Pyranthrone and its Halogeno Derivatives at High Temperature. American Cyanamid Co. *USP* 2,548,545–6

Addition of at least 25% on the weight of pyranthrone or its derivative of an inorganic nitrite or halogenate when using it in vats at high temperatures results in marked improvement in the strength and brilliance of the dyeings. C. O. C.

Pigment Dyeing. Dan River Mills. *BP* 657,426

Deeper and more brilliant coloration is obtained by use of a pigmented oil-in-water emulsion containing a water-insoluble resin if the material to be coloured has first been treated with a resin-forming substance or with formaldehyde or glyoxal, e.g. has been crease-resiste l. Mixtures of fibres give more solid dyeings by this method than if the pigment emulsion is applied without the pretreatment. C. O. C.

Dyeing Polyamide and Polyester Fibres with Sulphur Dyes. Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek ten Behoeve van Nijverheid, Handel en Verkeer. *BP* 657,469

Polyamide and polyester fibres can be dyed with sulphur dyes if the dyebath contains 50% or more in the case of deeper dyeings, of dye on the weight of the goods. The dye is preferably reduced with 0·5 g. hydrosulphite and 0·006 ml. 25% ammonia per g. of dye. The dyeings are very fast to rubbing and washing. C. O. C.

Dyeing Polyesters. Stevensons (Dyers). *BP* 659,667

Dyeings of acetate rayon dyes on polyesters are greatly deepened and brightened by steaming them for 1–10 min. at 10–40 lb./sq. in. C. O. C.

Dyeing Acrylonitrile Polymers with Acetate Rayon Dyes. American Viscose Corpn. *USP* 2,548,853

The affinity of acrylonitrile for disperse acetate rayon dyes is greatly enhanced by first treating it in 75–85% aq. H_2SO_4 for 15–300 sec. at room temperature, washing free from acid, and drying before entering into the dye-bath. The time of treatment varies inversely with the concentration of the sulphuric acid. Deep level dyeings of excellent fastness to light and washing are obtained. C. O. C.

Colouring Glass Yarns or Fabrics. J. Mandleberg & Co. *BP* 657,430

The material, without previous etching, is impregnated or printed with a solution of cellulose in cuprammonium hydroxide, or a cellulose ester solution, containing a dye or a substance capable of developing a dye, after which the cellulose is regenerated or the solvent evaporated. C. O. C.

Improving the Fastness of Direct Dyeings—Pigments—Animalising Cellulosic Fibres (III p. 29).
Printing or Colouring Cloth with Aqueous Pigment–Resin Suspensions (IX p. 41).

IX— PRINTING

Fast Colour Printing. F. Farrington, F. V. Davis, and P. W. Smith. *J.S.D.C.*, **67**, 579–585 (Dec. 1951).

Studies in the Fundamental Processes of Textile Printing. III — Transfer of Indigosols to Cellulose during Steaming. A. M. A. El Borai and H. A. Turner. *J.S.D.C.*, **67**, 586–598 (Dec. 1951).

Use of Acetate Rayon Dyes in Textile Printing. W. Shaw. *J.S.D.C.*, **67**, 599–608 (Dec. 1951).

Screen Printing of Textiles. O. F. Habel. *Amer. Dyestuff Rep.*, **40**, P 672–P 674 (15 Oct. 1951).

A brief review of screen printing covers screens, squeegees, agers, driers, and flash development. J. W. B.

Canarin [Indigosol O — Formation of Yellow Tones in Printing]. L. Driessen; G. Torinus. *Melliand Textilber.*, **32**, 715 (Sept. 1951).

Driessen disagrees with a statement made by Torinus (*ibid.*, **31**, 847 (1950)) with regard to the alleged production of yellower hues with Indigosol O in printing. He maintains that he observed this phenomenon in 1931 and attributed it to the formation of canarin. This observation is disputed by Torinus, who maintains that this effect has not been observed in practice when the correct printing recipes are employed. B. K.

Pigment Printing. H. Bartl. *Melliand Textilber.*, **32**, 634–638 (Aug. 1951).

A review is given of methods available for printing textiles with pigments. The introduction of emulsion colours has led to a wide extension of pigment-printing methods. The nature, use, and relative merits of Aridye (Interchemical Corpn.) colours and Orema (Ciba) colours are discussed in detail. A. E. S.

Development of Diazaminols (Rapidogens) in the Neutral Ager. N. E. Fedorova and I. B. Migacheva. *Tekstil. Prom.*, **11**, 22–24 (Aug. 1951).

Diazaminols (azoic printing mixtures of the Rapidogen type) may be developed in neutral steam if an addition of Leucotrope O is made to the printing paste. The dye components are dissolved in caustic soda soln. in the usual way, but before adding the Leucotrope, ammonium chloride is added to reduce the pH, as otherwise resin-like substances are formed. Also, additions of urea and dicyandiamide are found to be advantageous. For the production of bright colours the Leucotrope O must be of high purity. To make 1 kg. of a typical printing paste 60 g. of Diazaminol Scarlet (a mixture containing the o-anisidide of 2:3-hydroxynaphthoic acid and a stabilised diazo cpd. from 2-nitro-5-methoxyaniline) is dissolved in hot water with the aid of 30 g. of glycerol, 20 g. of dicyandiamide or urea, and 15 g. of 38·7% NaOH soln., and the soln. obtained is added to neutral thickening. The paste is cooled, and a soln. containing 16 g. of ammonium chloride is added. The paste is allowed to stand for 15 min., and then a soln. of 30 g. of Leucotrope O is added.

Reserves under Aniline Black may be obtained by introducing sodium sulphite and zinc oxide into the recipe. Experiments *in vitro* indicate that in the steamer hydrolysis of Leucotrope O proceeds with liberation of HCl until a pH of 8–8·5 is established. A. E. S.

Danlos Process for making Colour Prints. P. Danlos. *Bull. Assocn. franç. Ing. et Techniciens Cinéma*, **5**, (9), 8–10 (1951).

PATENTS

Printing or Colouring Cloth with Aqueous Pigment-Resin Suspensions. Monsanto. *BP* 659,078.

The cloth is treated with an aqueous suspension of a pigment and an ammonium or amine salt of a copolymer of a subst. or unsubst. styrene with maleic anhydride or a partial ester of maleic acid and is then cured at 225–325°F. The resultant coloration is resistant to rubbing and washing. C. O. C.

Accelerating the Drying of Printed or Coated Surfaces. E. A. Timson. *BP* 660,001

The printed or coated surface is treated with a material which combines with a component of the printing or coating medium to form an azeotropic or other mixture having a lower b.p. than either component. C. O. C.

Printer's Blanket. Dewey & Almy Chemical Co. *BP* 659,617 *USP* 2,547,220

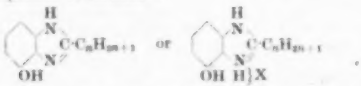
A printer's blanket of long working life consists of several plies of rubber-coated cloth vulcanised together, the cloth of at least the top ply being butted along a line of interfitted Vs having bases which are but small fractions of the width of the blanket, the length of the Vs being several times that of their base. C. O. C.

Transferring a Powder Image to a Transfer Material. Battelle Memorial Institute. *BP* 658,699

An electrostatic powder image is transferred from a plate to the material to be printed by electrical means only, without wetting the transfer material or pressing it against the powder image. C. O. C.

4-Hydroxy-2-alkylbenziminazoles as Azo Coupling Components in Diazotypes. General Aniline. *USP* 2,548,845

Compounds of formula—



(n = 0–3; X = anion of a salt-forming acid) are stable to discoloration in storage, yield prints of dense brilliant coloration fast to light and washing, and do not render the background liable to discolour on exposure to light. C. O. C.

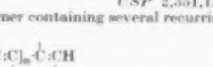
Lumazines and Alloxazines as Catalysts in Dye Bleach Baths for Colour Photography. General Aniline. *BP* 657,374

Mordanted Dye Layers for Photographic Purposes. Eastman Kodak Co. *USP* 2,548,564

Addition polymers containing periodically occurring quaternary ammonium groups, particularly those prepared from vinylazines, are powerful mordants capable of fixing the soluble acid dyes used in photography. C. O. C.

Hydrophilic Colour Former Layer having a Light-sensitive Diazonium Salt dispersed therein. DuP. *USP* 2,551,133

A hydrophilic colour former containing several recurring groups of formula—



(n = 0 or 1) and having a light-sensitive diazonium compound dispersed therein is coated upon paper or other suitable support. C. O. C.

Mordanted Imbibition Dye-printing Blank. Eastman Kodak Co. *USP* 2,548,575

When using blanks containing as mordants the polymerised quaternised vinyl-azines and -azoles of *USP* 2,484,430, diffusion of the mordant into the matrix is prevented by incorporating acidic polymers, e.g. polyacrylic acid, into the surface of the mordanted blanks. C. O. C.

Anti-stain Baths for Colour Photography. General Aniline. *BP* 659,362

The final rinse consists of an aqueous solution of an addition product of HCHO and a diazine or triazine. C. O. C.

Method and Apparatus for Making Photographic Colour Prints. Kodak. *BP* 660,099

Increasing the Fastness of Diazotype Images. General Aniline. *BP* 660,088

The fastness, particularly to wet processing, of diazotype images is materially improved by incorporating in the light-sensitive layer a water-soluble dicyandiamide–formaldehyde condensate and an ammonium or aromatic primary or secondary amine salt having at least one unoccupied position *ortho* or *para* to the NH_2 group. C. O. C.

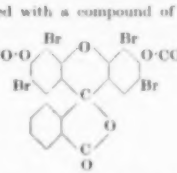
Hydroxy- and Amino-1:3:4-triazapyrrocolines as Blue-Black Photographic Toning Agents. General Aniline. *USP* 2,553,500

Printing and Developing Solvent Images—Electrophotography. C. F. Carlson. *USP* 2,551,582

A uniform electrostatic charge is given to the surface of a photoconductive insulating coating on a suitable base. The charged coating is then exposed, e.g. in a camera, to the design to be copied. This discharges the electrostatic charge in proportion to the quantity of light reaching each part of the coating. The "electrostatic latent image" so formed is then developed by depositing a finely divided material on to the coating, e.g. by dusting with a powder or spraying with an atomised liquid. This powder or liquid can then be transferred to a sheet of paper. If the paper to which such a liquid has been transferred is immediately treated with a colouring material soluble in the liquid, e.g. passed over a roller coated with dye, then a visible image is produced on the paper. Machinery for the continuous production of such prints is described. C. O. C.

Record Material which yields a Distinctive Colour when Heated. National Cash Register Co. *BP* 658,379

Material treated with a compound of formula—



(R = CH_3, C_2H_5, or C_3H_7) and preferably a mild alkali, e.g. sodium carbonate, phosphate, or stearate, has a slight yellow tint but becomes red where touched by a heated stylus or the like. C. O. C.

Record Material which yields Visible Marks under Pressure. National Cash Register Co. *BP* 660,502

Modification of *BP* 628,980, one of the colour-forming components being liquid and the other solid, so that more intimate association of the two components occurs when the liquid is released by fracture of the insulating medium. C. O. C.

Printing Pastes for Decorating Heat-resisting Bases. Johnson, Matthey & Co. *BP* 658,940

Modification of *BP* 628,504 (*cf. A.* **66**, 161 (1950)), the cellulose derivative being replaced by a natural and/or synthetic resin. C. O. C.

Developments in the Application of Dyes to Cellulose Acetate Rayon (VIII p. 39).

Colouring Glass Yarns or Fabrics (VIII p. 40).

Multicoloured Sheets or Coatings of Polyvinyl Resins (XIII p. 45).

X—SIZING AND FINISHING

Synthetic Yarn Preparation. D. Cook. *Amer. Dyestuff Rep.*, **40**, P 649–P 652 (1 Oct. 1951).

An account of the reasons for and practice of sizing synthetic yarns for knitting and weaving covers numerous new products. J. W. B.

Finishing of Woven Cotton Fabrics. R. H. Drukker. *Amer. Dyestuff Rep.*, **40**, P 706–P 709, P 714 (29 Oct. 1951).

A brief survey of cotton finishing covers mercerisation, starch finishing, softening, loading, calendering, water-repellency, fire-retardancy, and the use of resins in general. J. W. B.

Old Fulling Methods. K. G. Ponting. *J.S.D.C.*, **67**, 436–438 (Nov. 1951).

Formation of Cover on Soft Worsted Cloths. Anon. *Wool Record*, **80**, 1072, 1075, 1077 (27 Sept. 1951).

A practical account of the precautions necessary during the dry and wet finishing of these fabrics in order to avoid irregularities or unevenness in the finished cloths. C. O. C.

Improvement of Cotton Cloth in Resistance to Soiling and in Ease of Washing. W. P. Utermohlen, M. E. Ryan, and D. O. Young. *Text. Research J.*, **21**, 510–521 (July 1951).

The effect of various treatments on resistance to soiling and ease of washing is described. The most promising for cloth exposed to liquid-dispersed soils appeared to be partial carboxymethylation of the fibre, treatment with a resin bearing carboxy groups, or application of certain softeners. It is noted that all these could confer an electrical charge and cation-exchange properties upon the cotton cloth. Neutral vinyl resins and hydrophobic finishes made the soil particles more difficult to remove by washing. Starch, cationic softeners, and some vinyl resins enhanced the ease of soil removal, but also increased the ease with which soil was acquired. A. B.

Degradation of Natural Fibres by Micro-organisms—III and IV. W. Wegener and R. Questel. *Melliand Textilber.*, **32**, 670–674 (Sept. 1951).

The influence of the following elements on the growth of micro-organisms is discussed— P, K, Mg, Ca, S, Fe, Zn, Ba, Be, B, I, and Si. Experimental work is described on the influence of pH on the growth of mildew and bacteria. The general conclusions are that the influence of alkali and acids is not as great with mildews as with bacteria. In addition mildews require less moisture than bacteria, so that they are the main cause of the degradation of textiles. B. K.

Rôle of Dichromate in the [Rotproofing] Treatment of Fabrics. M. N. Zusman, Z. K. Yakubenko, and E. A. Petrova. *Tekstil. Prom.*, **11**, 27 (Aug. 1951).

A widely used finishing process for tent fabrics and the like consists in treating the material successively with tanning extracts, with a soln. containing copper sulphate and sodium dichromate, with paraffin-wax emulsion, and with aluminium acetate soln. Dichromate serves two purposes— it causes an increased uptake of copper by the tannins (the tannin–copper complex is mainly responsible for the antibacterial properties), and it prevents the corrosion by the copper sulphate of the iron parts of the apparatus in which the treatment is done (it is effective for this purpose at concentrations > 3 g./litre). A. E. S.

Impregnation of Fabrics with Aqueous Dispersions of Hydrophobic Substances. II—Determination of the Heterocapillarity of Closely Woven Fabrics. S. S. Voyutsky and L. E. Peregudova. *J. Appl. Chem. (U.S.S.R.)*, **24**, 984–988 (Sept. 1951).

For the satisfactory impregnation of fabrics with aqueous dispersions, the particle size of the dispersed material must be appreciably less than the average size of the capillary spaces in the fabric. The particle size in impregnation liquors that have been found satisfactory in practice is generally < 1–$2\ \mu$. There are few data available concerning the pore size in fabrics. A method is now given for the determination of the pore-size distribution in fabrics, and it is applied experimentally to closely woven two-ply and four-ply cotton material (grey and scoured). A long strip of the fabric, 1 cm. wide, is graduated along its length in pencil and is hung vertically in a long glass tube, closed at the upper end and attached at the lower end to a conical flask containing alcohol. The lower end of the strip is immersed in the alcohol to a depth of 2 cm. Diffusion is allowed to proceed until equilibrium is attained (about 7 days). The strip is then removed and rapidly cut up into sections of equal length. The alcohol content of each section is then determined by weighing before and after drying. The experiment is repeated starting with a strip that is saturated with alcohol, so that equilibrium is attained from the other side. Higher alcohol contents are obtained by this method, and a mean of the values given by the two methods is taken for each section. The average height h of a section determines the average radius r of the group of pores corresponding to capillary rise to points within the length of the section Δh—

$$r = \frac{2\gamma}{h\rho g}$$

where γ is the surface tension of alcohol and ρ is its density. The number N in this group of pores is given by—

$$N = \frac{W_n - W_{n+1}}{\pi r^2 \rho \cdot \Delta h}$$

where W_n and W_{n+1} are the weights of alcohol in the nth and $(n+1)$th strips (counting from the bottom). Further equations are readily derived for the total cross-sectional area S of a group of pores with a range of diameter Δd, and $S/\Delta d$ may be plotted against d to give a pore-size distribution curve. For all the fabrics examined there is a sharp max. in the region of 10–30 μ. There are few capillaries of $< 10\ \mu$, but many in the range of 30–400 μ. The number of these larger pores is diminished by the scouring process, while at the same time the number of small pores is increased. A. E. S.

Experiments on the Preparation of Oilcloth. S. N. Chatterjee, O. Prakash, and R. K. Gobhil. *Proc. Annual Convention Oil Technol. Assocn. India*, **2**, 32–36 (1945): *Chem. Abs.*, **45**, 8266 (25 Sept. 1951).

10% Starch solution containing 1% borax is a suitable sizing composition. Use of a volatile thinner in the undercoat is disadvantageous because of its penetrating tendencies. An undercoat of paint containing 25–30% of boiled linseed oil and a second coat of a paint containing 40–45% of the oil yielded a surface free from cracking and peeling. A good gloss was obtained by giving a third coat of a long oil copal varnish. C. O. C.

PATENTS

Preparing Cellulose for Treatment with Sodium Hydroxide. Research Corpn. *USP* 2,549,713

Cellulose pretreated with an organic liquid of small molecular size, e.g. a halogenated hydrocarbon of 1–3 C, when treated with NaOH swells more and reaches the maximum swelling point quicker than does the untreated cellulose. The absorptivity and reactivity of the cellulose are also improved in other directions, e.g. dyeing is rendered easier. C. O. C.

Improving the Tensile Strength of Cotton Yarn. United States Rubber Co. *USP* 2,549,014

Cotton yarn is given greater tensile strength by treating it first with 0·1–2·0% aq. NaOH, Na_2CO_3, Na_3PO_4, NH_3, or an amine and then with an anhydrous organic solvent at 50–150°C. for 5–120 min., the solvent being such that it volatilises when the yarn is dried. The best results are obtained when the yarn is kept under tension during part or all of the treatment in each bath and during drying. C. O. C.

Improving the Tensile Strength of Native Cellulose Fibres by Treatment with Rosin Amines. United States Rubber Co. —— *USP* 2,553,396

The tensile strength of grey cotton yarn is much improved by treating it with condensed or uncondensed polynuclear hydroaromatic primary amines, e.g. dehydroabietylamine. C. O. C.

Continuous Stretching of Cords. Dunlop Rubber Co. *BP* 657,688

Continuous stretching of cords and similar cotton or rayon materials is carried out in an atmosphere of steam inside a cylinder which contains a steam inlet, inlet and outlet orifices for the cord, and means for stretching the cord during passage through the cylinder, and for heating, e.g. electrically, the steam while in the cylinder. J. W. B.

Cloth Glazing and Embossing. ICI. *BP* 660,002

Effects more durable than those produced by the process described in *BP* 425,032 are obtained by impregnating with an aq. soln. of a bisurea–formaldehyde precondensate, partly or completely drying, mechanically treating to produce the desired effect, and then baking. C. O. C.

Rendering Cellulosic Textiles resistant to Acid Fumes. British Jute Trade Research Assocn. *BP* 657,506

Cellulosic textiles required to resist acid fumes, e.g. bags of granulated chemical fertilisers, are impregnated with 3% or more of an alkaline salt of benzoic acid which is highly soluble in water, e.g. sodium benzoate. C. O. C.

Flameproofing Cellulosic Fibres. American Cyanamid Co. *USP* 2,549,058

The material is impregnated with a mixture of a finely divided oxide of Sn, Ti, Sb, or Bi, a thermoplastic substance containing at least 20% by weight of combined halogen, which when heated ruptures at the carbon–halogen bonds, and with a water-soluble guanidine or guanylurea salt of an oxygen-containing polyacid of quinquevalent phosphorus. All three components are applied simultaneously from an aqueous bath, or the phosphorus acid salt may be applied separately from the other two components. There is no loss in tensile strength, and the proofed material has a soft handle.

USP 2,549,060

The third component is replaced by a water-soluble, metal-free, nitrogen-containing salt of an aminophosphoric acid having an amino N atom attached directly to a P atom and of m.p. < 200°C. C. O. C.

Reducing the Feltability of Wool. Bradford Dyers' Assocn. *BP* 658,977

Material wholly or partly of wool is passed through a chamber at the same time that chlorine gas is fed into it, the speed of entry of both material and chlorine being controlled so that each fibre gets treated with the amount of chlorine necessary to reduce its feltability to the desired degree having regard to the potential felting shrinkage of the material and its water content. Material containing > 10% moisture is uniformly treated. C. O. C.

Reducing the Feltability of Wool. Monsanto. *BP* 658,994

Material consisting wholly or partly of wool is impregnated with a urea–aldehyde condensate and/or an aliphatic or heterocyclic amino compound–aldehyde condensate and/or an alkylated derivative of such a condensate together with a small amount of free formaldehyde, and is then cured, preferably by heat. The treated material is resistant to felting and shrinking, and retains a natural handle after repeated washing. C. O. C.

Reducing the Felting Property of Wool. M. R. Coe. *USP* 2,548,774

The felting power of wool is reduced without affecting its level dyeing properties by treating it in a closed chamber under superatmospheric pressure, e.g. 5–15 lb./sq. in., at > 100°C. with an oxidising agent, e.g. 0·001–0·1% aq. alkali-metal permanganate, for 5–10 min. C. O. C.

Decatising. Richmond Pôle Dye Works. *BP* 659,004

The fabric is carried along between a steam-permeable blanket and an endless conveyor into a steaming zone, into which a jet of dry steam is directed from the blanket exit in a direction counter to the direction of blanket travel and away from the blanket, suction being applied to the jet of steam through the blanket and the material. This is followed in another zone by a similar treatment with wet steam at a temperature less than that of the dry steam. This gives rapid and even decatising with no risk of the fabric becoming spotted. C. O. C.

Non-static Finish for Angora Rabbit Wool. I.-S. Anitil. *BP* 657,538

Trouble with static electricity with Angora rabbit wool is avoided by treating it with an aldehyde or formic acid at not > 100°C. and < pH 7. If formaldehyde is used the pH must be > 1. C. O. C.

Finishing Nylon Hose sized with Polyvinyl Alcohol. Adams-Millis Corpn. *USP* 2,549,564

The loose hose are treated in absence of any tension or shaping device in an aqueous bath at 212°F. containing sodium carboxymethyl cellulose, hydrogenated wax, and polyvinyl acetate. This removes the polyvinyl alcohol size and replaces it by polyvinyl acetate. Finally the hose are placed on forms, if desired after dyeing, and then given an aqueous treatment at > 212°F. This eliminates the necessity for preboarding and yields hose which neither stick to the seaming machine nor shrink during dyeing and finishing. C. O. C.

Forming Designs in Nylon Fabrics. Perforations. *USP* 2,550,893

The fabric, particularly stockings, is placed over a plate having holes pierced normally through it. Several fabric-piercing members can be selectively forced through the fabric so as to form a predetermined design, each of these members being rotated while it is piercing the fabric. The fabric is then heat-set while pierced by these members. *USP* 2,550,894

A stocking is placed on a preboarding form, and portions of the threads are forced apart by inserting a pointed element between them, the stocking being then given the usual preboarding treatment while the threads are kept apart. C. O. C.

Rendering Materials Water-repellent. General Electric Co. *USP* 2,553,314

Solids are rendered water-repellent by treating them with the liquid obtained by treating dimethyldichlorosilane containing a small proportion of methyltrichlorosilane with enough liquid anhydrous ammonia to yield a methylpolysilazine free from silicon-bonded chlorine. C. O. C.

Fire- and Heat-resisting Finish. Albi Chemical Corpn. *BP* 657,599

Material is given increased resistance to fire and heat by coating it with a thermosetting salt of a basic N-containing anion exchange resin containing not < 2 milliequiv. per g. of resin of a strong non-oxidising organic acid. C. O. C.

Rubberised Fabrics. Research Assocn. of British Rubber Manufacturers. *BP* 658,116

Fabric is formed mainly from continuous-filament yarn, but including a proportion of spun staple fibre, e.g. nylon or Orlon of high tensile strength, which provides effective adhesion with rubber or rubber-like compositions; these are applied by dipping or spreading, calendering or moulding, followed if necessary by vulcanising. J. W. B.

Films and Coatings from an Aqueous Dispersion of Chlorinated or Unchlorinated Rubber Hydrochloride. Rubber-Stichting. *BP* 660,449

The dispersion is spread thinly on to a smooth surface (from which the final film can be peeled) or a base to which the final film will adhere tenaciously, e.g. cloth, and then heated to below the b.p. of water at the pressure area. After all the water has evaporated, heating is continued to a temperature between that at which the material softens and that at which it decomposes, being kept at this temperature until a clear coherent film or coating is formed. C. O. C.

Felts for Papermaking Machines. Theorr Felt & Blanket Co. *BP* 657,477

Papermaking felt contains a cured polymerised synthetic resin and cured butadiene–acrylonitrile copolymer. In one example the felt is impregnated firstly in a mixture of — 60% urea–formaldehyde resin (100 g.), water (500 g.), 28% ammonium hydroxide (12 g.); then squeezed, cured for 2 hr. at about 200°F., and aged overnight, a pick-up of 11% being obtained. The felt is impregnated again in a rubber emulsion comprising— 40% solid content aqueous emulsion of butadiene–acrylonitrile copolymer (100 g.), water (300 g.), and 28% ammonia (4 g.); then squeezed, and cured for 2 hr. at 250°F., a pick-up of 10% being obtained. Wear resistance is increased and water retention considerably lowered. J. W. B.

Pile Fabrics and Sheet Materials with Surface-adhering Fibres. Dunlop Rubber Co. *BP* 657,820

Pile fabrics are produced by electrostatic deposition of fibres or other finely divided material on to an adhesively coated backing. A current of air carries suspended fibrous material, and is driven past an electrode charged to a high potential relative to the backing, from which it is passed to the backing material by way of an insulated conduit. J. W. B.

Carrotting. American Hatters & Furriers Co. *BP* 657,493

Fur fibres are carrotted by treating in presence of a source of active oxygen with an aq. soln. of nitric and nitrous acids containing (*a*) soluble salts of one or two radioactive elements, (*b*) a soluble salt of a multivalent metal, salts (*a*) and (*b*) being in such proportion as to give an average at. wt. of the metals of 123–220 and a radioactive half-life of not < 90 days, (*c*) a mineral acid

hydrolysing agent, and (*d*) as retarding agent a water-soluble aliphatic organic acid and/or water-soluble potassium salt. Uncarrotted rodent fibres before carrotting have a mol. wt. of 38,000–43,000, which is increased by carrotting to 248,000–252,000. This is caused by the formation of xanthoproteic acid from the cystine groups in the fibres. It is the presence of this xanthoproteic acid which imparts felting properties to the fibres, and not any physical structure of their surface. If > 35% xanthoproteic acid is formed, the fibres lose in tensile strength; if more than 54% is formed, the fibres will readily dissolve in acetone, and fibres having many of the physical properties of silk may be spun from such solutions. J. W. B.

Improving the Fastness of Direct Dyeings—Pigments—Annealing Cellulosic Fibres (III p. 29).
Accelerating the Drying of Printed or Coated Surfaces (IX p. 41).

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Research and the Paper Industry in Britain To-day. A. H. Nissan and G. F. Underhay. *Research*, **4**, 503–508 (Nov. 1951).

A commentary and review with 43 references. C. O. C.

Fibre Structure and Pulp Properties. II—Influence of Ultrasonic Treatment on Wood Cellulose Fibres. W. H. Algar and H. W. Giertz. *Svensk Papperstidning*, **54**, 693–700 (31 Oct. 1951).

The ultrasonic treatment of 0·05% pulp suspensions occupied 30 min. at 22 kilocycles/sec., the pulps having been made in the laboratory from the same sample of Swedish spruce wood. Under ultrasonic treatment the fibres swell more strongly than in normal swelling in water, and at the same time they split lengthwise and become fibrillated. This applies particularly to pulp rich in hemicelluloses. In certain cases the same "balloon" formation occurs as in swelling with chemical agents. This indicates a strong swelling pressure in the interior of the fibre, which the primary wall withstands. With under-cooked sulphite pulp the primary wall is weakened to such an extent that the fibre is easily swollen, and it opens under ultrasonic treatment in spite of the lower hemicellulose content. Pulp extracted with hot alkali does not swell to an appreciable extent, and cold-extracted scarcely at all. Sulphate pulp does not swell in spite of high hemicellulose content. This can be taken as indicating that compounds are formed during the sulphate cook that give the fibre structure an enhanced strength. S. V. S.

Chemistry and Technology of Synthetic Macromolecular Compounds. II—Preparation and Polymerisation of Mixed Acetic Methacrylic Esters of Cellulose. A. A. Berlin and T. A. Makarova. *J. Gen. Chem.* (*U.S.S.R.*), **21**, 1267–1273 (July 1951).

Treatment of cotton cellulose with a mixture of methacrylic acid and acetic anhydride in presence of sulphuric or perchloric acid as condensing agent and of quinhydrone as polymerisation inhibitor leads to the introduction of acetyl groups only. Similar results are obtained with a mixture of methacrylic anhydride and acetic acid. Treatment of cellulose with methacryloyl chloride in presence of pyridine results in considerable destruction of the cellulose and the introduction of not more than one methacryloyl group per 8 glucose residues. A product that is insoluble in organic solvents and has the composition of cellulose monomethacrylate is obtained as follows—Cotton is immersed in cold 87% formic acid for 24 hr. It is then washed several times with methacrylic acid, squeezed to 300% of the original wt., and added during 1–1·5 hr. to a stirred mixture of methacrylic anhydride (50–100% excess over the amount required for the formation of trimethacrylate), methacrylic acid, and conc. H_2SO_4 (8% on the cellulose) at 10–15° C. The temp. is raised to 45°C, and stirring continued for 18–19 hr. The mixture appears to become homogeneous, but microscopic examination shows that much fibrous matter is still present. The product is separated by the addition of 50% aqueous alcohol. When this monomethacrylate is completely acetylated with acetic anhydride in presence of H_2SO_4, about one-third of the methacryloyl groups are displaced by acetyl. A further product containing methacryloyl groups (> 0·25 per glucose residue) is obtained by treating secondary cellulose acetate (54·5% CH_2·COOH) with methacrylic anhydride in acetone soln. The product dissolves in chlorinated hydrocarbons as well as in acetone and ethyl acetate. When benzoyl peroxide is added to solutions of acetic–methacrylic esters of cellulose, polymerisation occurs with formation of insoluble products that are three-dimensional in structure. When methyl methacrylate is present also, copolymerisation occurs with similar results. A. E. S.

PATENTS

Printing Paper of Improved Ink Bleed Resistance. National Cash Register Co. *BP* 659,036

A clay having needle-shaped particles, e.g. attapulgite or halloysite, used as a filler, or as a surface coating in conjunction with a binder such as starch, casein, polyvinyl alcohol, or animal glue, gives better ink bleed resistance than kaolin. S. V. S.

Coating Compositions for producing Mineral-coated Paper. Monsanto. *BP* 660,356

A coating composition for use on one or both sides in the preparation of mineral-coated paper comprises a slurry of a mineral pigment in an aqueous dispersion of a styrene–alkyl acrylate (Alk of 1–8 C) copolymer. The copolymer is 4–30% of the weight of mineral pigment and has mol. wt. such that a solution of 1 g. in 100 c.c. of benzene has a viscosity of 1·5–7·5 centipoises at 25°c. S. V. S.

Mildewproofing Mineral-coated Paper. S. D. Warren Co. *USP* 2,548,646

Mineral-coated papers containing proteinaceous, amylaceous, or polyvinyl alcohol adhesives are rendered resistant to mildew formation by adding to the coating composition a water-soluble salt of pentachlorophenol or an organic-solvent solution of pentachlorophenol and then precipitating the pentachlorophenol in a difficultly soluble form on the paper. C. O. C.

Sized Paper of High Wet Strength. Strathmore Paper Co. *USP* 2,549,177

Starch which has been cooked with 5% of its dry weight of glyoxal has greatly increased wet tensile strength and wet-rub value. C. O. C.

Water- and Flame-proofing Paper. Paper Patents Co. *USP* 2,553,154

Paper is impregnated with an aqueous emulsion of asphalt, dewatered, and then impregnated with a wax dispersed in an aqueous solution of a flameproofing salt. C. O. C.

Tracing Paper. Renker-Belipa. *BP* 660,327

A homogeneously transparent tracing paper is obtained by impregnating paper with a pure resin solution and after drying, heating to above the m.p. of the resins used. C. O. C.

Carboxyalkyl Methyl Ethers of Cellulose. Dow Chemical Co. *BP* 659,506

Cellulose ethers containing 0·7–2·1 methoxyl and 0·02–0·3 carboxyalkyl groups per anhydroglucose unit are soluble directly in water at room temperature and remain dissolved when the solutions are heated to 80°c. or higher. C. O. C.

Films of Hygroscopic, Non-Fibrous, Organic Material. British Cellophane. *BP* 657,342

Hygroscopic, non-fibrous, organic film having no tendency to stick to itself is produced by applying to newly formed film, e.g. of regenerated cellulose, a liquid aqueous dispersion of silica the particles of which carry an electric charge opposite to that developed by the film, and drying. J. W. B.

Pressure-sensitive Record Material. National Cash Register Co. *USP* 2,550,466–73

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

Effect of Tension on Water Absorption by Hair. L. R. G. Treloar. *Nature*, **168**, 521–522 (22 Sept. 1951).

Equilibrium moisture absorptions of horsehair under stress are measured by direct weighing, recordings being made when the stress is alternately applied and removed. There is a small, constant, and reproducible weight increase

on stressing, a result in the opposite direction to that found by White and Stam (*Text. Research J.*, **19**, 136 (1949)). J. W. B.

Free Amino Groups of Collagen. J. H. Bowes and J. A. Moss. *Nature*, **168**, 514–515 (22 Sept. 1951).

After heating in water at 70°c., or treating in alkali or urea, a small number of α-amino groups are found in collagen, none being detectable before treatment. Reasons for this are discussed. J. W. B.

Tanning with Avaram Bark in Southern India. K. S. Choudary and R. Selvarangan. *J. Sci. Ind. Research* (India), **10 B**, 99–100 (1951): *Chem. Abs.*, **45**, 8791 (10 Oct. 1951).

Avaram bark, the principal tanning agent used in Southern India, contains catechol tannin. Leathers tanned with it darken on exposure to light. An after-treatment with myrobalan gives a coating of pyrogallol tannin, and this prevents the darkening. C. O. C.

PATENTS

Tanning Proteinaceous Fibres with an Aldehyde-Polyhydric Phenol Mixture. John R. Evans & Co. *USP* 2,552,129

Furs, hides, casein filaments, etc. are tanned with an aqueous solution containing resorcinol or pyrogallol (1 mol.) and formaldehyde, furfural, benzaldehyde, or crotonaldehyde (not < 2 mol.), the pH of the solution being maintained at 0·3–3·0. Numerous examples of the application of the process to various materials are given. *USP* 2,552,130

Limiting the amount of polyhydric phenol in the solution to approx. 1% by weight gives a tanning liquor which not only tans the leather of animal skins but renders it possible to set the hairs permanently straight by means of a hot mechanical treatment. The hairs are also rendered more resistant to heat and alkali. C. O. C.

Recovering Fats, Dyes, and Leather Extract from Scrap Leather. E. Karlson and H. E. Karlson. *BP* 661,196

An aqueous mixture of scrap leather is treated in an autoclave with an alkali until the mixture has pH 6–7. It is then cooled, the fat being then skimmed off, treated with nitric acid for not < 1 hr., the fat being again skimmed off, neutralised, and filtered. The filtrate can be used as a leather filler. If after acidification, e.g. with H_2SO_4, the solids produced are washed and dissolved in alkali, a brown dye is obtained. Alternatively, if the filtered neutral solution is treated with HNO_3, the resulting solids yield a yellow dye when dissolved in alkali. C. O. C.

Bleaching and Filling Leather with Amino-carboxylic or -sulphonic Acid-Hydroxymethylmelamine Resin. American Cyanamid Co. *USP* 2,550,638

Leather is bleached and filled by impregnating it with an aqueous solution of the polymerised condensate of 1 mol. of an aminocarboxylic acid and 1–2·5 mol. of a hydroxymethylmelamine.

USP 2,550,639

The polymerised condensate of 1 mol. of an amino-sulphonic acid and 1–2·5 mol. of a hydroxymethyl-melamine or a hydroxymethylmelamine–hydroxymethyl-urea copolymer is used. C. O. C.

Lacquers for Finishing Leather. S. Siddiqui and D. C. Dhar. *BP* 657,695

A lacquer particularly suitable for making patent leather consists of a solution of an oil-resin prepared according to the process of *BP* 650,342 and a cellulose ester in a mixture of butyl acetate and solvent naphtha. The film it gives has excellent flexibility and adhesion to leather, and is unaffected by changes in atmospheric humidity and temperature. C. O. C.

Preventing the Shedding of Hair or the Peeling of Scales from Pelts and Hides. G. A. Rubbinson. *BP* 659,637

A rubber solution or latex is applied to the skin side, and then the hair or scale side is subjected to a lower gas pressure than the skin side, so as to suck the solution or latex into the pores, whereupon it is vulcanised. C. O. C.

Optical Rotation and Chain Folding in Synthetic Polypeptides and Gelatin (VI p. 37).
(I) Configuration of Polypeptide Chains; (II) Polypeptide Chains in Muscle (VI p. 37).

XIII—RUBBER; RESINS; PLASTICS

Effects of X-Rays upon Plastics—(I) Electronic Processes. M. J. Day and G. Stein; (II) Paramagnetic Resonance. E. E. Schneider, M. J. Day, and G. Stein. *Nature*, **168**, 644–645 (13 Oct. 1951).

I—Treatment of samples of commercial coloured Perspex with X-rays produces a new absorption band and a reduction in optical density of the original absorption band of the dye. Visually, a darkening is apparent. Diffusion of oxygen into the irradiated plastic produces a partial reversal of the phenomenon in that the new band disappears, but the original peak absorption does not return to normal value. It is suggested that some of the electrons liberated from the lattice by radiation become trapped by and attached to the dye, a system of positive holes and negative ions being formed. Such systems might yield useful information on electron capture processes in solids.

II—Sharp paramagnetic response spectra are obtained on a number of dyed and undyed samples of plastic following X-ray irradiation, and it is considered that dye molecules provide electron traps which are considerably deeper than those of the plastic host lattice. A relation is thought possible between resonance values and the regular "identity periods" derived by X-ray diffraction measurements. J. W. B.

PATENTS

Carbon Black Mixes directly from Natural Rubber Latex. United States Rubber Co. *BP* 660,925

Flexible Film bearing a Design. M. A. Chavannes. *BP* 658,248

A design of fluid film-forming substance of one or more colours is printed on an endless non-stretching carrier, and then a continuous layer of film is formed over the design by a dispersion or solution of a vinyl resin and a plasticiser. After drying, the film is stripped from the carrier. The resulting films retain the design permanently even when their surfaces become worn. C. O. C.

Decorative Plastic Sheets. M. A. Chavannes. *BP* 661,171

Imitation reptile skin or pebble-grained flexible sheets in two-tone designs are produced by applying to the raised points of an embossed supporting surface a layer of film-forming substance, e.g. a dispersion of vinyl acetate–vinyl chloride copolymer and plasticiser, drying this, and applying a similar though differently coloured film to the whole surface, drying, and stripping off the dried two-tone film. If desired, a further plastic or textile backing may be applied to the film before stripping. J. W. B.

Catalysts for Curing Phenolic Resins. Spolek pro Chemickou a Hutní Výrobu. *BP* 657,551

Catalysts for curing Stage II phenolic resins at room temp. comprise Sb, Bi, or stannic halides or their co-ordination compounds with e.g. benzoic acid or acetaldehyde. E. C.

Oil-modified Epoxide Resins. Devoe & Raynolds Co. *BP* 657,816

Resins suitable for use in paints and varnishes are prepared by esterifying resinous epoxides (42–47%) obtained by reaction of an epichlorohydrin and a bisphenol, e.g. bishydroxyphenylpropane, in presence of alkali, with resin (13–16%) and drying-oil fatty acids (40–42%). E. C.

Styrene–Maleic Anhydride Copolymers. Monsanto. *BP* 657,547

The mass copolymerisation of styrene or its nuclearly substituted derivatives with an αβ-ethylenedicarboxylic anhydride is more readily controlled on addition of 0·1–1·5 moles per mole of anhydride of the methyl, ethyl, or n-propyl half ester of the corresponding acid. E. C.

Multicoloured Sheets or Coatings of Polyvinyl Resins. Balatum N.V. *BP* 658,530

Textiles, paper, etc. on a temporary support are printed with the design in colours each formed of a suspension of a polyvinyl resin and a pigment in a plasticiser. The printing is effected so that each colour extends throughout the thickness of the resulting composite coating, which is then heated so that it gelatinises. C. O. C.

Thixotropic Film-forming Solution of Acetone-insoluble Polyvinyl Chloride (III p. 30).

Films and Coatings from an Aqueous Dispersion of Chlorinated or Unchlorinated Rubber Hydrochloride (X p. 43).

XIV—ANALYSIS; TESTING; APPARATUS

Fifteen Years of International Standardisation in the Textile Industry and in Textile Machinery Manufacture 1936–1951. K. Hentschel. *Melliand Textilber.*, **32**, 579–585 (Aug. 1951).

An outline of international work on the standardisation of textile nomenclature and testing, yarn-number and piece-width ranges, machine parts, etc. The discussion concerns the work of the I.S.A. Textiles Committee from its formation in 1936 up to the outbreak of war in 1939, the work done by Germany and her associates during the war period, and the work done since 1946 by the I.S.O. Committee for Textiles and Textile Machines, without the participation of Germany. A. E. S.

Evaluation of Wetting Agents. S. V. V. Chala, K. S. G. Doss, and B. S. Rao. *Proc. Annual Convention Oil Technol. Assocn. India*, **2**, 12–18 (1945); *Chem. Abs.*, **45**, 7806 (10 Sept. 1951).

A 0·5-g. hank of 20s grey yarn is shaken with 100 c.c. of the solution being tested in a 125-c.c. bottle for 0·5 min. The hank is then removed from the solution and rolled from end to end 15 times under a 0·5-lb. roller. A du Nouy tensiometer was modified for use in determining the density of the hank. The result is called the "apparent density No." (A.D. No.) and is calculated as—

$$\text{A.D. No.} = \frac{\text{Weight of grey yarn in air} \times 100}{\text{Loss of weight under water}}$$

The A.D. No. of three commercial wetting agents are compared with their Herbig No. 31 references. C. O. C.

Estimation of Polyglycol Ethers of the Leonil Type used in Wool Scouring. H. Haakh, D. von Candé, and W. Mohus. *Melliand Textilber.*, **32**, 699–701 (Sept. 1951).

Leonil O and Leonil FFO (IG) are polyglycol ethers used as soap substitutes in wool scouring. These products form ppt. with albumins, and a method of detection and estimation based on this property is detailed using a condensate of resorcinol and glucose. Polyglycol ethers can also be extracted or separated quantitatively from aqueous soln. with *n*-butyl alcohol. B. K.

Extraction of the Active Agent from Detergent Mixtures. S. A. Miller, B. Bann, and A. P. Ponsford. *J. Appl. Chem.*, **1**, 523–524 (Nov. 1951).

The active agent in dilute (0·4–4·0%) detergent solutions may be separated quantitatively from builders, etc. by adding sodium carbonate (4%), extracting with *n*-butanol, and evaporating the extract *in vacuo*. The method is applicable to anionic, cationic, and non-ionic compounds. W. K. R.

Estimation of the Stability of Oil Emulsions. N. Schönfeldt. *Melliand Textilber.*, **32**, 773–774 (Oct. 1951).

A method is described for expressing the stability of oleine emulsions and also of fatty acids and fats in general. The method consists in determining the changes in concentration which occur after fixed intervals by means of saponification values, from which the stability factor of the emulsion can be calculated. B. K.

Fire Hazards of Oils in the Woollen Industry. F. E. T. Kingman and E. H. Coleman. *J. Textile Inst.*, **42**, T 402–T 412 (Oct. 1951).

Tests are described to assess the relative fire hazard of various oils used in the woollen industry. Tests are made on oils in bulk. The flash points are determined by the Cleveland open-cup method. Ease of ignition is determined by floating a measured quantity of benzene on the surface of the oil and igniting; the rate of burning is assessed by igniting and measuring the loss in weight of the oil. A method is described in which the oil is dispersed on carded web, which is placed on asbestos board and ignited at one end, the rate of travel of the flame being determined. Another method is to impregnate asbestos cord with the oil and measure the rate of burning. This test is more accurate than the card web test owing to variation in density of the web; also, in this test a number of estimations can be carried out simultaneously. The results are easily reproducible. There is a discussion on the effect of web variation and amount of added oil, also on the nature of the oils, three types of which are used in the tests, viz. Control Combing Oil No. 16 (neutral vegetable oil), Brown Cloth Oil, 95% F.F.A. No. 1 (oleine), and Pool 5D No. 3 (mineral oil). A broad classification as measured by flash point and rate of spreading of the flame on asbestos cord is shown to be related to the fire hazard under conditions closely approaching those encountered in practice. A. H.

Sulphite Method for the Complete Analysis of Solutions containing Hypochlorite and Chlorite. E. I. Vlasyuk. *Tekstil. Prom.*, **11**, 36–38 (Aug. 1951).

Dil. hypochlorite solutions of any pH can be titrated directly with standard sodium sulphite soln. using a drop of acidified starch–iodide soln. as external indicator (strong solutions should be made alkaline before titration). After adding the amount of sulphite found to be necessary for reaction with the hypochlorite present, a soln. may be analysed for alkali in the usual way, or for chlorate by adding (for 10 ml. of soln.) 1 g. of KBr and 20 ml. of 39% HCl, allowing to stand for 5 min. (closed flask), adding 100 ml. of 1% KI, and titrating the liberated iodine with 0·1 N-Na_2SO_3. Mixtures of hypochlorite and chlorite must be diluted considerably before titration (to a chlorite concn. of $< \sim 0{\cdot}005$ N.). Thus, to 10 ml. of the soln. additions are made of 250 ml. of water, 10 ml. of $NaHCO_3$ soln. (50 g./litre), and sufficient acid to neutralise the soln. to phenolphthalein. It is then titrated with sulphite, using starch–iodide paper as external indicator, to give the hypochlorite content. When the end-point is reached, additions are made of 10 ml. of 10% KI and 10 ml. of 10% H_2SO_4, and after standing for 5 min., the soln. is again titrated with sulphite soln. in order to determine the chlorite content. A. E. S.

Determination of Nitrites. H. Barnes and A. R. Folkard. *Analyst*, **76**, 599–603 (Oct. 1951).

A number of modifications of the colorimetric method for estimating nitrites, by diazotising sulphanilic acid and coupling with α-naphthylamine to produce a red dye, have been examined. Two procedures, which give rapid colour development and optimum absorption with Ilford green filters (604), are recommended. W. K. R.

Practical Determination of Dye Class. W. Otto. *Textil Praxis*, **6**, 675–676 (Sept. 1951).

A scheme is outlined and experimental details are given of a method for the determination of the dyeing class of an unknown dye. G. L.

Determination of Uncombined α- and β-Naphthol in Coal-tar Colours. L. S. Harrow. *J. Assocn. Off. Agric. Chem.*, **34**, 127–130 (1951); *Chem. Abs.*, **45**, 9271 (25 Oct. 1951).

A method based upon that of Hilpert and Gille (*Chem. Abs.*, **27**, 4192) is described. The naphthols are extracted and coupled with diazotised *p*-nitroaniline, and the resulting dye is determined spectrophotometrically. Recoveries of the naphthols added to various dyes varied from 88·2 to 100·8%. C. O. C.

Determination of β-Naphthylamine in FD&C Yellow No. 3 and 4. L. S. Harrow. *J. Assocn. Off. Agric. Chem.*, **34**, 131–132 (1951); *Chem. Abs.*, **45**, 9271 (25 Oct. 1951).

The amine is distilled from an alkaline saturated salt solution of the dye and determined spectrophotometrically. Recoveries of amine added to the dyes averaged 80%. C. O. C.

Determination of *m*-Diethylaminophenol in D&C Red No. 19 and D&C Red No. 37. L. S. Harrow. *J. Assocn. Off. Agric. Chem.*, **34**, 133–135 (1951); *Chem. Abs.*, **45**, 9271 (25 Oct. 1951).

The *m*-diethylaminophenol is steam-distilled from a saturated salt solution of the dye adjusted to pH 6·6 ± 0·2. With D&C Red No. 37 a second distillation is necessary to avoid interference due to presence of stearic acid. The *m*-diethylaminophenol is determined spectrophotometrically. C. O. C.

Polarographic Reduction of some Aminoacridines. R. C. Kaye and H. I. Stonehill. *J.C.S.*, 2638–2646 (Oct. 1951).

1-, 2-, 3-, 4-, and 5-Amino- and 2:7- and 2:8-diaminoacridines yield polarograms in aqueous solution which are

distorted by adsorption at the dropping-mercury electrode. This adsorption is less marked than for acridine, and, as with the latter, may be eliminated by adding ethanol. In aqueous–ethanolic solution, the aminoacridines, like acridine, are reduced in two one-electron steps, with the intermediate formation of a highly stable semiquinone. Theoretical equations are derived to describe the observed relation between half-wave potential and pH for each step. H. H. H.

Chromatographic Separation of Vat Dyes. N. R. Rao, K. H. Shah, and K. Venkataraman. *Current Sci.* (India), **20**, 66–68 (1951): *Chem. Abs.*, **45**, 8775 (10 Oct. 1951).

Description of a method of separating vat dyes by using aqueous tetraethylenepentamine $NH_2{\cdot}[CH_2{\cdot}CH_2{\cdot}NH]_3{\cdot}H$ and Na thiosulphate. C. O. C.

Galenical Examination of Frangula Bark. O. E. Schultz. *Pharmazie*, **5**, 541–548 (1950): *Chem. Abs.*, **45**, 7751 (10 Sept. 1951).

A colorimetric method is given for determining 1:8-dihydroxyanthraquinone, 1:8-dihydroxy-3-methylanthraquinone, and 1:8-dihydroxyanthranol. C. O. C.

Colorimetric Determination of Indigo. J. Lotichius and J. Kooyman. *J.S.D.C.*, **67**, 435–436 (Nov. 1951).

Identification of Textile Materials. *J. Textile Inst.*, **42**, s 25–s 114 (Oct. 1951).

This issue, the third edition, begins with a general introduction followed by a description of the properties of the natural and synthetic textile fibres. Notes on the tests include—preparation of material for staining, desizing and stripping of dyes, method of cutting cross-sections, tests for urea and formaldehyde, etc. There is also a description of the density gradient test for determining the densities of fibres. Analytical tables include—preliminary analysis of materials with the aid of the microscope, analytical scheme for the identification of textile materials, preliminary analysis of materials without the aid of the microscope (for use with the commoner fibres), the densities of the principal fibres, dimensions of some animal and vegetable fibres, and burning tests. There are 64 photographs of fibres both longitudinally and in cross-section, also an index. A. H.

Abrasion Tests on Fibres. A. Zart. *Textil Praxis*, **6**, 752–753 (Oct. 1951).

Details are given of an instrument suitable for testing wet fibres using Perlon wire as abrasive. It is essentially an improved model of an apparatus previously described and is stated to provide valuable results when the mean values of 100 separate determinations are recorded. G. L.

Gravimetric Estimation of the Carboxylic Acid Group in Cellulose. J. Farrar, S. M. Neale, and G. R. Williamson. *Nature*, **168**, 566 (29 Sept. 1951).

Carboxyl content in cellulose and other insoluble polysaccharides is estimated by soaking the material overnight in a saturated solution of uranium acetate in water, washing thoroughly, drying in an oven, weighing, ashing at 700° C., and weighing the ash as U_3O_8. Uranium content may also be estimated by weighing in water before and after soaking in uranium acetate, using a hydrostatic balance. J. W. B.

Modified Cuprietylenediamine Method for Cellulose Viscosity Determinations. K. E. Almin. *Svensk Papperstidning*, **54**, 628–631 (30 Sept. 1951).

The determination of the viscosity of cellulose in cuprietylenediamine is carried out in a solution that is prepared immediately before use from the stock solutions of $CuCl_2$, ethylenediamine, and NaOH. The accuracy of the method is discussed together with the dependence of the reduced viscosity on cellulose concentration. S. V. S.

Experiments with a Small Rotary Core-sampling Tube for Raw Wool. G. C. LeCompte, H. R. Keller, and S. P. Davis. *Amer. Dyestuff Rep.*, **40**, P 659–P 660 (1 Oct. 1951).

A ¾-in. rotary coring tube is described, as a replacement for the unwieldy 3-in. type already in use, for taking samples from bales of raw wool to determine loss in weight on standard scouring. Tables of results and statistical findings are given. J. W. B.

Colorimetric Determination of Amino Acids by the Ninhydrin Reaction. A. M. Smith and A. H. Agiza. *Analyst*, **76**, 623–627 (Nov. 1951).

The coloured compound formed in the reaction between amino acids and ninhydrin may be used as a quantitative measure of the amino acid decomposed. The hue and depth of colour are not the same for all the common amino acids, but for individual acids there is a linear relationship between colour intensity and concentration in the range 5–25 μg. of amino nitrogen. The method is not accurate for the determination of total amino nitrogen in a mixture, but is convenient for determining the submicro quantities of amino acids obtained from a drop of protein hydrolysate fractionated by two-dimensional paper chromatography. W. K. R.

Identification of Free Carboxyl Groups in Peptides. J. Tibbs. *Nature*, **168**, 910 (24 Nov. 1951).

Experiments with insulin and keratin suggest that the Schlack and Kumpf procedure for identifying peptides which provide terminal carboxyl groups may have to be modified, though it has been used successfully for glycyl-leucine and glycylvaline. Benzoylated dipeptide is treated with ammonium thiocyanate, acetic acid, and acetic anhydride to convert to the thiohydantoin derivative; this is refluxed with 20% HCl, and the hydrolysate extracted with nitromethane. After drying *in vacuo* and hydrolysing with $Ba(OH)_2$, excess hydroxide is removed as $BaCO_3$, and the hydrolysate examined by paper chromatography. Ninhydrin development shows only one clear spot, corresponding to the acid carrying the free carboxyl group. J. W. B.

Measurement of Stiffness in Textile Fabrics. I—Comparison of Fine Methods of Laboratory Evaluation. II—Study of Peirce Cantilever Test for Stiffness of Textile Fabrics. N. J. Abbott. *Text. Research J.*, **21**, 435–444 (June 1951).

The subjective evaluation of stiffness is used as a standard with which to compare the results obtained using the cantilever test, the heat loop test, the Schiefer Flexometer, the Planoflex, and the M.I.T. Drapeometer. The Peirce cantilever test was selected for further study, and a specific technique is recommended. A. B.

A.A.T.C.C. Dynamic Dimensional Change Meter—Measurement of Shrinkage and Elongation of Woven Fabrics. E. P. Johnstone. *Amer. Dyestuff Rep.*, **40**, P 710–P 714 (29 Oct. 1951).

A strip of fabric under test is fitted to the arm of a balance, the pointer being brought to a central position by weights and a chain drum at the other side. The lower end of the test strip is spring-loaded so that the piece may be under any strain desired. A surrounding cylinder is then filled with water or other liquid, and accompanying dimensional changes are noted, and again noted after draining and drying. Continuous observation enables dimensional change to be measured over the whole drying cycle, and good reproducibility is claimed. J. W. B.

Precision Instrument for Detergency Studies. H. J. Wollner and G. S. Freeman. *Amer. Dyestuff Rep.*, **40**, 693–696 (29 Oct. 1951).

A non-rotating washing cylinder oscillates along a vertical axis and contains two impact surfaces which are perforated to permit passage of liquid. A disc of test fabric is placed between them and during movement of the cylinder is forced up and down through the detergent solution, being subjected to impact at the end of this stroke. The motion may be described mathematically by the usual sine wave equations. Detergency is evaluated either by reflectance measurements on the standard soiled cloth before and after washing, or by measuring the solution turbidity photometrically. J. W. B.

Changes in the Colour Sensitivity of the Eye with Posture. A. Blackie; F. Taylor. *Nature*, **168**, 524 (22 Sept. 1951).

Two comments on the letter by J. N. Aldington (*Nature*, **168**, 86 (14 July 1951)). J. W. B.

Fixed Standards for Staining Assessment in Fastness Testing. O. L. Davies and E. Marney. *J.S.D.C.*, **67**, 438–440 (Nov. 1951).

Development of the Society's Washing Fastness Tests for Coloured Cellulosic Materials. L. A. Lantz. *J.S.D.C.*, **67**, 441–447 (Nov. 1951).

Identification Scheme for Textile Finishing Agents on the Fibre. C. H. Giles and E. Waters. *J. Textile Inst.*, **42**, *p* 909–*p* 932 (Oct. 1951).

A scheme has been devised for the identification of more than sixty finishing processes on cellulosic fibres. A preliminary examination involves heating, water spotting, testing for chlorine and nitrogen, and microscopic observation after treatment with cuprammonium hydroxide. Following the preliminary examination further tests are applied, these being set out in the form of analytical tables. The scheme covers the identification and analysis of flame-, rot-, and mildew-proof finishes and also finishes used for stiffening, softening, crease-resisting, and imparting water-repellency. In many cases the tests are applicable to other materials than cellulosic, e.g. acetate rayon, nylon, paper, and resins in substance. Lists of finishes and reagents are given in appendices. A. H.

Improvement of Lustre of Cotton. I—Measurement of Reflectance Characteristics related to Lustre. L. Fourt and A. M. Sookne. *Text. Research J.*, **21**, 469–479 (July 1951).

The use of two instruments, one a fixed-angle reflectometer and the other a goniophotometer or variable-angle photometer, for measuring the reflectance characteristics of cotton is described, and a general wide-scale correlation with larger differences in lustre as appraised visually is obtained. The effect of cover, the precision of the measurements, and the effects of tension in winding, of relative humidity, and of the size of the illuminating and viewing beams all produce variations which need to be cared for by standardisation of technique. The variable-angle instrument gives considerably higher contrast ratios, but the range covered by the fixed-angle instrument is sufficient for most of the work on cotton. A. B.

Simple Volumetric Method for Estimation of Degree of Carrotting of Rabbit Fur. P. Hückel. *Melliand Textilber.*, **32**, 693–694 (Sept. 1951).

The degree of carrotting of rabbit fur is a measure of its felting capacity. It has been found that carrotted fur is stained by potassium permanganate, whilst non-carrotted fur is virtually unstained, under prescribed conditions. The staining is fast to water and is proportional to the degree of carrotting, and thus permits quantitative assessment. Fur (0·1 g.) is treated for 5–30 min. at 15–30°C. with not < 120 ml. of 0·01–0·04 N-$KMnO_4$. The treated fur is washed through glass wool, and unabsorbed permanganate titrated with acidified oxalic acid. The effect of variations in time of treatment, temp., and concn. of permanganate is given graphically. A mean of five tests is suggested, and the testing method can be used for both mercuric and non-mercuric carrotted fur. B. K.

Application of the Specific Gravity Gradient Column to the Quantitative Determination of Additives in a Base Material. C. R. Stock and E. R. Scofield. *Text. Research J.*, **21**, 521–526 (July 1951).

The specific gravity gradient column of Linderstrom-Lang is described and discussed in terms of its range, sensitivity, stability, and calibration. The use of such a column to measure the concentration of a melamine resin applied to a wool cloth for control of shrinkage is explored. A. B.

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Measuring or Recording pH Values of Solutions. C. Morton. *BP* 657,955

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Stress Strain Recording Mechanism for Extensometer. W. & T. Avery. *BP* 660,210

An electrical autographic stress–strain recorder is described for use with an extensometer having a pair of electrical contacts, which part on deformation of the test piece and which are reset by means of a micrometer screw. W. G. C.

Testing the Tailoring Qualities of Fabrics. Henry Booth Methods Corpn. *USP* 2,547,367

Filter for Photoelectric Colorimeter. A. L. M. A. Rouy. *USP* 2,550,382

A method of selecting a filter for use in precise quantitative concentration determinations over a wide range of concentrations is described. C. O. C.

Impregnation of Fabrics with Aqueous Dispersions of Hydrophobic Substances. II—Determination of the Heterocapillarity of Closely Woven Fabrics (X p. 42).

XV— MISCELLANEOUS

Some Recent Work on Diffusion in High Polymers. J. Crank and G. S. Park. *Research*, **4**, 515–520 (Nov. 1951).

A review with 30 references. C. O. C.

Limits of the Visible Spectrum. M. H. Pirenne. *Research*, **4**, 508–515 (Nov. 1951).

A review of present knowledge, with 23 references. C. O. C.

PATENTS

Casings for Colouring Foodstuffs. Transparent Package Co. *BP* 658,444

The casing material, e.g. regenerated cellulose casings used for making skinless sausage, is coated with colouring material which will transfer to the food placed in the casing. This gives very uniform colouring of the surface of the resultant product after removal of the casing. C. O. C.

Use of Dyes to recover Streptomycin. Chas. Pfizer & Co. *USP* 2,555,760–3

Streptomycin is almost quantitatively precipitated from fermentation broths by addition of Orange II (*C.I.* 151) or Naphthol Blue Black (*C.I.* 246), a streptomycin–dye salt being formed. This reaction is made use of in obtaining pure streptomycin. C. O. C.

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FORTHCOMING MEETINGS OF THE SOCIETY—*continued*

BRADFORD JUNIOR BRANCH

All meetings held in the Bradford Technical College at 7.15 p.m.

1952

Monday 18th Feb.	Dr. C. S. Whewell (Leeds University) *The Wet Finishing of Wool Textiles*
Thursday 28th Feb.	THE JUNIOR BRANCH DANCE at the Queen's Hall
Wednesday 5th March	J. A. Hepworth, Esq., B.Sc., A.T.I. (Shell Chemicals Ltd.) *Petroleum Derived Chemicals in the Textile Industry*
Saturday 8th March	Visit to Wool Industries Research Association, Torridon
Tuesday 25th March	E. E. Tallis, Esq., B.Sc., A.R.I.C. (Courtaulds Ltd.) *Recent Developments in Viscose Rayon and Staple Manufacture*

There will be a visit to Salts (Saltaire) Ltd., the date of which has not yet been fixed.

LEEDS JUNIOR BRANCH

All meetings to be held in the Colour Chemistry Lecture Theatre, Leeds University, at 4 p.m.

1952

Tuesday 5th Feb.	B. Kramrish, Esq., or J. A. Potter, Esq. (The Clayton Aniline Co. Ltd.) *The Dyeing of Vinyl Polymers*
Tuesday 26th Feb.	Dr. F. L. Warburton (Wool Industries Research Association) *Colour Vision*

MANCHESTER JUNIOR BRANCH

All meetings commence at 6.30 p.m.

1952

Friday 14th Mar.	Lecturer from the Bleachers' Association Ltd. Name later. *Progress in Textile Bleaching.* Reynold's Hall, College of Technology, Manchester

WEST RIDING SECTION

All meetings held at the Great Northern Victoria Hotel, Bradford, at 7.15 p.m. unless otherwise stated

1952

Thursday 14th Feb.	G. G. Taylor, Esq., B.Sc., A.Inst.P. (Clayton Aniline Co. Ltd.) *Uses of Microscopy in Textile Dyeing and Finishing*
Thursday 28th Feb.	Dr. A. S. C. Lawrence (Dept. of Chemistry The University, Sheffield) *Detergents* (exact title later)
Tuesday 4th March	T. Thorne Baker, Esq. (Director of Research, Dane & Co. Ltd.) *Fluorescent Dyestuffs and the Application of Fluorescent Textiles.* Metropole Hotel, Leeds
Thursday 13th March	Details later
Thursday 27th March	ANNUAL GENERAL MEETING

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Persons desirous of joining the Society as Ordinary Members or Junior Members may obtain Application Forms from the General Secretary, or from the Honorary Secretary of any Section of the Society

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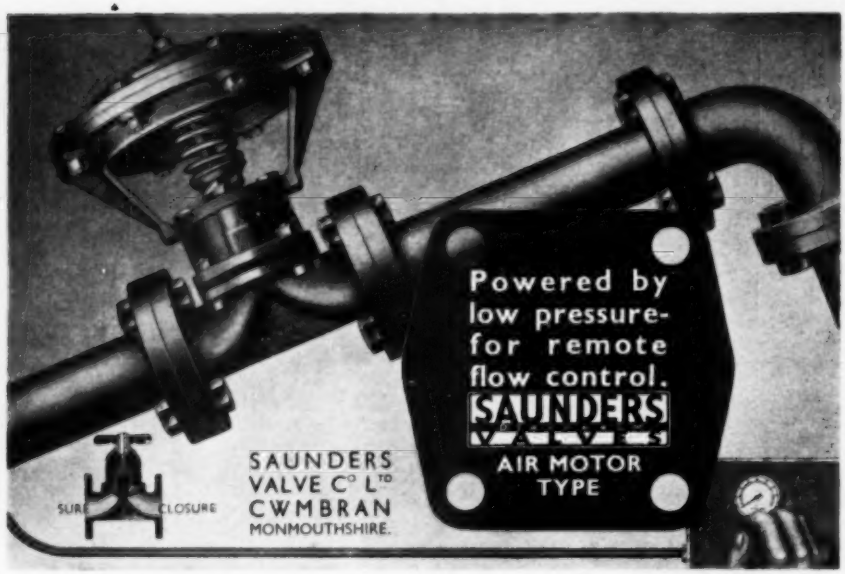

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SITUATIONS VACANT AND WANTED, Etc.

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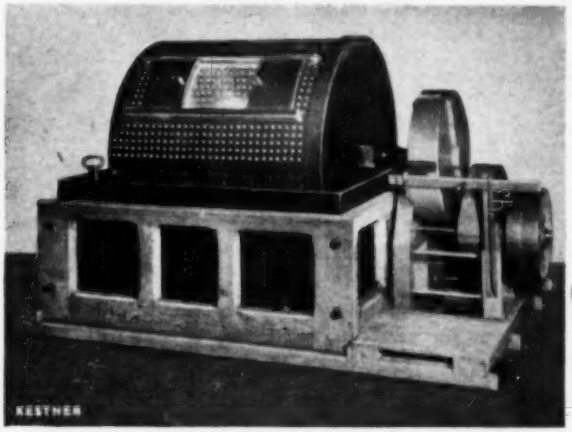

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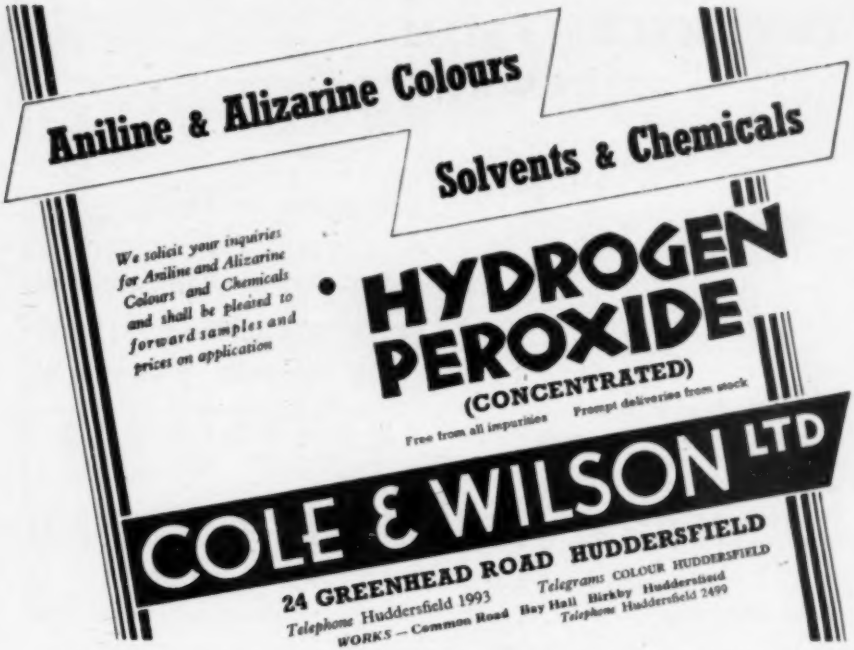
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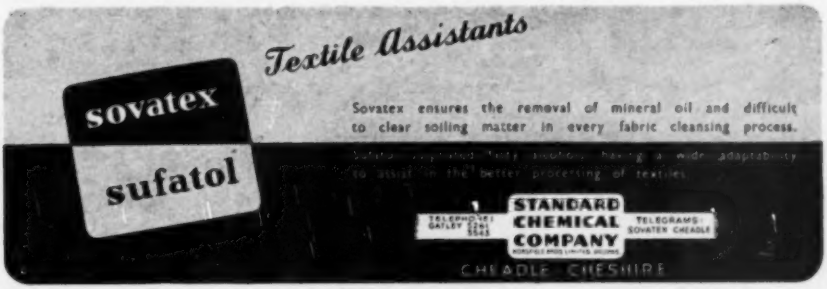
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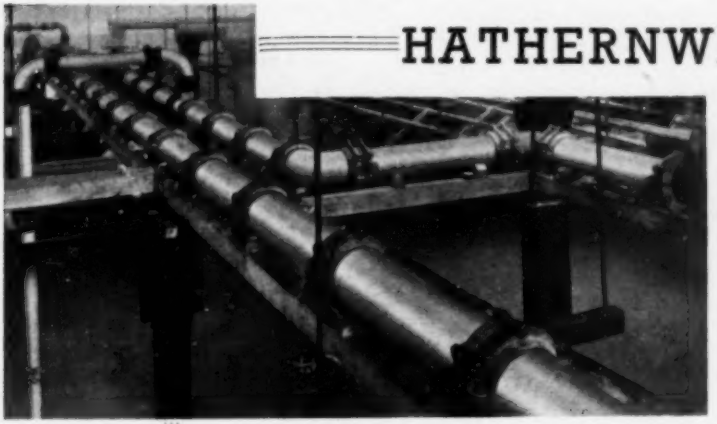

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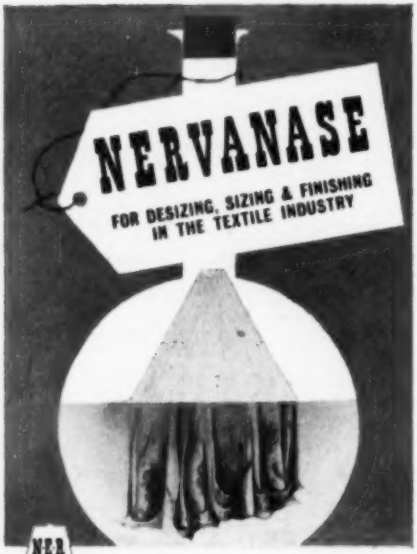

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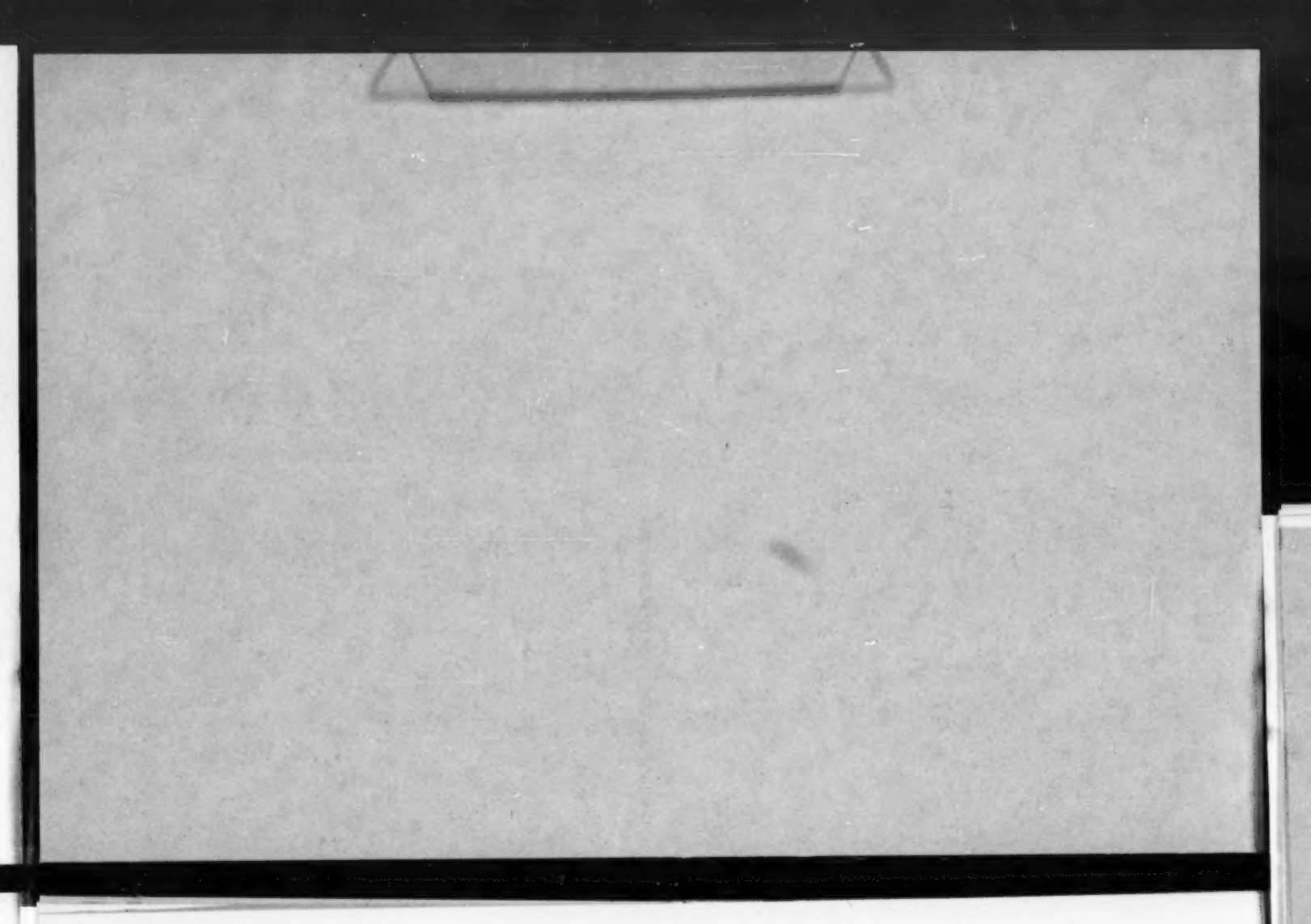

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